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# TROY PUBLIC SCHOOLS

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Long Range Planning Subcommittee:

EXHIBIT 1  
DATE Dec. 13, 11  
HB 15

I am honored to be able to address you this morning about a subject that has been of great value to the Troy School System.

On July 1, 2009, we were awarded an energy efficiency Quick Start grant in the amount of \$180,812. This project was to replace single pane windows at our elementary school and our high school. Not only did our teachers complain of the cold in the winter and the hot in the spring and fall, but our clerk complained each winter month when we received our heating bill.

Due to the streamlined bidding process and competitive bidding, we were able to successfully complete the project for only \$98,000.

Because of the cooperation and efficiency of the Department of Commerce we were able to complete the project in 3 months from start to finish.

I can tell you that we have drastically improved the energy efficiency of our school buildings.

Then in January of 2010, we were awarded a Quality Schools Planning Grant in the amount of \$25,000. To understand the need for this grant you need to understand our facilities. Our junior high students are housed in a 3 story brick building built in 1916. Our HS gym was built in 1950 with classrooms added in 1958, 1979, 1982 and 1992. Our buildings are a true conglomeration that include a variety of roofs, electrical systems and heating systems, many of which are outdated. This planning grant allowed us to hire an engineering firm that did an intense study of our school buildings and presented us with a document that has already been of great value in the prioritizing of our maintenance plans.

I have been an educator for 33 years and am accustomed to the bureaucracy that occurs in our field but I was very impressed by the way the Quality Schools Grant Program through the Department of Commerce awarded, dispersed and accounted for the grants that we received. We greatly appreciate the funding and we equally appreciate the way that the grants were handled.

Brady D. Selle  
Superintendent  
Troy Public Schools

EXHIBIT 1

DATE Jan 13, 11

NO. 15

# **Facilities Master Planning Report**

**Troy Public Schools**

**Junior- Senior High**

**and**

**Elementary Schools**

**Troy, MT 59935**

**April, 2010**

Prepared by:



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Troy Public Schools  
Troy, MT  
Facilities Master Planning Report

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## INTRODUCTION

The purpose of this report is to identify and address deficiencies with the Troy School District's existing educational facilities. In particular, this report addresses; Life/Safety, Building Code Compliance, Americans with Disabilities (ADA) Compliance, Electrical and Data Infrastructure Improvements, Mechanical and Maintenance Improvements. This report (Facilities Master Plan) is intended to provide a long-term schedule of projects based on the inspection, evaluation of existing physical and/or operational deficiencies. This plan will target those areas where there is a critical need for upgrades and improvement to the schools.

Investigative evaluation of the facilities has been performed by professional engineers licensed in the state of Montana. These professionals include experts in the fields of mechanical, electrical and structural engineering. Additional professional services have been provided by an independent architectural consultant.

## **FACILITY & SYSTEM DESCRIPTION**

### Junior and Senior High School Campus

The Troy Junior and Senior High Schools are a single school campus consisting of multiple buildings which have been added in phases throughout the years. The oldest of these buildings is the 21,788 square foot, two-story Junior High School which was constructed around 1917. The senior high school is a single-level, multiple phase construction building totaling approximately 36,968 square feet. Most of the construction of the high school is in the 1950's era with an addition in 1992.

The 58,756 square foot Troy Junior-Senior High School campus has a combined current enrollment of about 236 students, 72 seventh and eighth graders at the junior high and 164 students at the high school. The total staff and employees for the campus are around 26.

The Troy Junior-Senior High school facility is located on 118 E Missoula in Troy, MT. The telephone number is 406-295-4606.

### Junior High School Building

The Junior High building (built around 1917) consists of 8 classrooms, an auditorium, a lunch room, a library, an audio/visual room and office support. The central portion of the building is the original, 3-story schoolhouse, an entry level, an upper level and basement. The basement consists of the boiler room, custodian's room, restrooms and storage. The upper level consists of 4 classrooms and a small computer room. Two additions have been added to the original 3-story schoolhouse on the entry level at the north and south. These additions match the original construction style of 1917. The construction consists of unreinforced brick, wood furring, lath/plaster walls and a wood-framed, flat, roof joist system. Reroofing projects have incorporated built-up roof insulation and EPDM membrane.

A basement boiler room contains a single, fuel-oil-fired steam boiler. This steam boiler was replaced as part of an improvements package in 1992. The assumed operating efficiency of the new boiler is around 75% (typical of this type and model). The steam distribution system for the school consists of a low pressure steam supply (5-psi) and a condensate return. The steam-heated terminal devices in the building consist of, wall radiators (original to the building), classroom unit ventilators and cabinet unit heaters.

### High School Building

The high school (built in the 1950's) is a separate building from the junior high connected by a covered breezeway. The single-story, high school building consists of 14 classrooms, a gymnasium, locker rooms and a detached shop building. The high school has undergone various additions and modernizations throughout the years and as a result there are multiple types of construction methods and materials. Wall construction materials include, concrete block with wood furring, block, brick veneer and wood-framing with wood siding. Two separate building improvement projects have modernized a portion of the original (oldest) classroom wing of the high school. These improvements include modernized, high-efficiency the wall framing systems as well as science class infrastructure.

The gymnasium (approx. 6,950 S.F.) is part of the original high school building. It is constructed of glue-laminated wood frames, wood purlins and brick veneer. The lighting consists of (24)-400 Watt metal halide light fixtures. The heating system for the gym is steam-driven, finned-tube radiators.

Four classrooms were added to the south end of the building in 1992. The construction style for this addition is concrete block with insulated wood furring and a wood-framed, pitched roof.

The shops building is a 7,000 S.F. separate building at the south end of the campus. The shops building is a single-level concrete block structure on a concrete slab foundation. The roof system is a wood-framed pitched roof. The shops classrooms consist of wood shop, auto shop, welding and drafting. The building is heated by an all-electric central air-handling unit with individually-zoned reheat coils. The central air-handling unit is located in an attic mechanical room. The wood shop and welding rooms are heated by ceiling-mounted, electric unit heaters.

There are two primary heating systems for the high school; a steam boiler plant, fired by fuel oil; and direct electric resistance. The heating source for the original school building consists of steam driven unit heaters and finned tube radiators. Additions and remodels over the years have introduced other types of heating equipment and devices. Four classrooms in the central (oldest) portion of the school are still heated by the original 1950's era steam, unit ventilators. The gymnasium is heated by the original finned-tube radiators which run the entire length of the 90-ft gymnasium. The adjacent boys and girls locker rooms are heated by ceiling-mounted unit ventilators with steam coils. The small weight room at the east end of gym is heated by 2 electric unit heaters.

Modernization of many of the classrooms has included the addition of new steam or direct-electric heating devices. The 1992, four-classroom addition at the south end of the building is heated by ceiling-mounted, hot-water fan coil units. Hot water for these units is indirect off of the steam boiler and pumped from the mechanical room. Domestic hot water for high school building is heated by the steam boiler with a heat exchanger.

#### Elementary School Building

W.F. Morrison Elementary School in Troy, MT is a medium-sized elementary school of approximately 32,335 square-feet with current enrollment of about 234 K-6 grade students and a staff of 19 employees. The school is made up of 19 classrooms, an 8,735 square-foot gymnasium/kitchen/locker room wing, office and administration, and a partial basement storage area. The facility is physically located at 501 E Kalispell St in Troy, MT. The telephone number is 406-295-4321.

The original school building was constructed around 1963. Three additions to the original building include a classroom wing addition in 1967, gymnasium/kitchen/classroom addition in 1978, and a classroom/basement storage addition in 1985. The school's exterior wall system is predominantly concrete block with wood-furred interior and some wood siding. Most of the windows in the building are the original single-pane, clear glass with wood frames. The building is primarily a single-level structure; a slab-on-grade floor system; and a partial basement under the

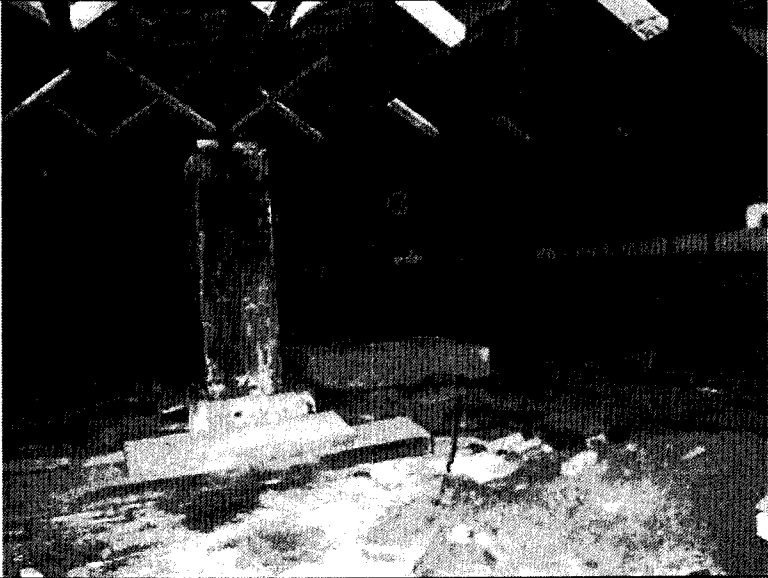
south end classroom wing. The roof system is a flat, roof joist structure with built-up roof insulation and membrane roofing.

There are two primary heating systems for the elementary school; a steam boiler plant, fired by two different fuel sources (fuel oil and wood pellet), and direct electric resistance. Six of the nineteen classrooms have modernized features. These modernized features include double-pane, insulated glass and direct electric resistance unit ventilators rather than steam. The 1978 gymnasium addition included a ceiling-suspended, direct-electric air-handling unit.

In 2005 an energy improvements upgrade to the school included the addition of a retro-fitted, wood-pellet burner to the existing steam boiler. The new pellet burning system also included an exterior pellet storage silo and conveyor feed line. No documentation of the cost of operating the pellet system has been recorded. The pellet system has only been operational for a very short period and has experienced some complications with becoming fully operational. For this reason, the pellet system has been included in the energy models performed for this study. The 2005 energy improvements upgrade also included the conversion of the 1978 electric gym air-handler to steam.

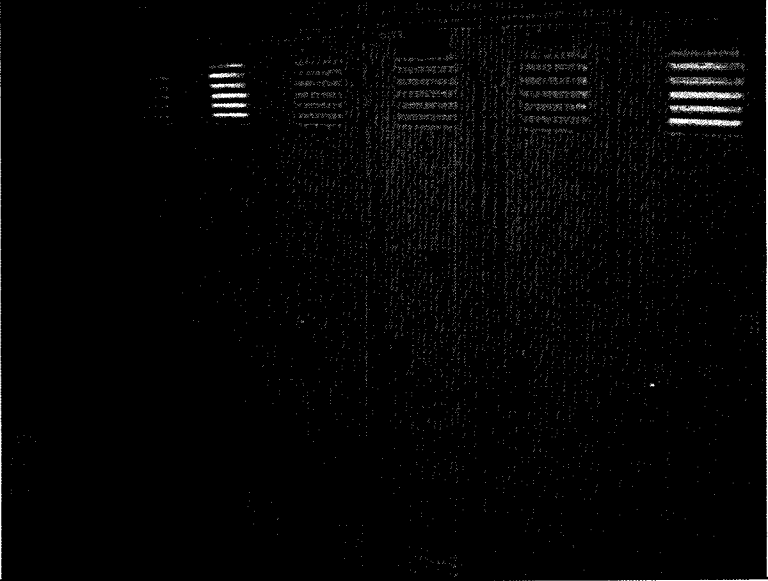
## GENERAL BUILDING SYSTEMS DEFICIENCIES


### High School

Item # 1G-HS	Description
Component:	Supporting floor structure
Location:	Gymnasium
Deficiency:	"Soft spots" in the gym's playing floor surface; Probable combination of inadequate post-and-beam structural support spacing and poor connection of subfloor to floor joist fastening.
Consequence:	Poor playing floor performance
Photo #1G-HS	
Recommendation:	Add intermediate post and beam support structure or adjustable steel support columns on cast in place concrete pier foundation. The column will be installed on a solid concrete base which is placed on engineered fill. The column is secured to both the concrete base and to the bottom of the beam or joists above. The support column adds stability and decrease the deflection of the joist.
Cost Estimate:	\$15,069
Priority:	Low


<b>Item # 2G-HS</b>	<b>Description</b>
Component:	Exposed bare soil in crawlspace
Location:	Gymnasium
Deficiency:	No ground cover moisture barrier.
Consequence:	Moisture accumulation/saturation of soil resulting in potential mold growth and/or damage to floor system and supporting floor structure. Excessive operation of the crawlspace humidity remediation fan/ventilation system resulting in wasted energy and reduced equipment life.
Recommendation:	Add approved ground cover moisture barrier. By installing a vapor barrier, the moisture level in the crawl space can be greatly reduced; this will help prevent mold and foul odors from forming.
Cost Estimate:	\$3,920
Priority:	High

<b>Item # 3G-HS</b>	<b>Description</b>
Component:	Building roof system
Location:	Refer to Roof Investigation Survey prepared by Benchmark Roof & Pavement Consultants, August 2007
Deficiency:	Various minor repairs/maintenance required. (Refer to roof survey report and roof plan R-2)
Consequence:	Potential water leakage
Recommendation:	Follow Recommendations as outlined in Roof Investigation Survey prepared by Benchmark Roof & Pavement Consultants, August 2007. Refer to Report and Appendix roof plan R-2 Annual or semi-annual maintenance is required to extend the life of the roof.
Cost Estimate:	--
Priority:	Medium

Item # 4G-HS	Description
Component:	Student lockers
Location:	Corridor, original high school building
Deficiency:	Chipping/spalling of paint from locker surface
Consequence:	Unsightly appearance
Photo #4G-HS	
Recommendation:	<p>Recondition and Resurface Lockers. The following procedures should be considered when resurfacing the lockers. Door operating hardware, built-in locks and number plates should be removed or thoroughly masked before painting. All surfaces to be painted should be sanded and washed with a proper agent to remove all dirt, grease and oil. All rusted surfaces should be sanded or wire brushed, thoroughly cleaned before painting. Spot prime or fully prime lockers, as needed.</p> <p>Electrostatically paint locker surfaces with a hard durable two-part polyamide epoxy or polyurethane paint. Paint should be applied with multiple coats to ensure a durable finish. Hardware should be reinstalled and repaired as necessary.</p>
Cost Estimate:	\$7,959
Priority:	Low


Item # 5G-HS	Description
Component:	4 Stainless steel urinals
Location:	Boy's restroom, original high school building
Deficiency:	No mechanical flush valve. Type of fixture allows water runs continuously with no means of shut off. Typical of all 4 fixtures.
Consequence:	Waste of water, higher water bills than necessary
Photo #5G-HS	
Recommendation:	<p>Remove and replace existing stainless steel urinals with new low flow (1 gpf or less) automatic flush valve urinals.</p> <p>Urinals, like toilets, use large amounts of water. Before the advent of low-flow models, many urinals required 2-3 gallons of water per flush. At the Troy High School the existing stainless steel urinals have a continuous water wall wash that far exceeds the 2-3 gallons of water per flush. Modern low-flow models all require less than 1 gallon per flush. When coupled with a touchless, automatic control valve, water savings produced by low-flow urinals is even greater.</p> <p>Touchless controls for restroom toilets and urinals have been widely promoted as a means of improving hygiene and promote water conservation in restrooms. By automatically flushing the units after use, automatic controls prevent users from over flushing.</p> <p>If we make a conservative estimate that the four current urinals have one (1) gallon per minute continuously flowing through the urinals. It can be calculated that the water used by these four urinals alone is 525,600 gallons per year.</p> $1 \frac{\text{gallon}}{\text{minute}} * 60 \frac{\text{min.}}{\text{hour}} * 24 \frac{\text{hours}}{\text{day}} * 365 \frac{\text{days}}{\text{year}} = 525,600 \frac{\text{gallons}}{\text{year}}$


	525,600 gallons per year is an average of 43,800 gallons per month. Based on the proposed City of Troy Water Rate Structure, the four urinals would use all of 42,840 gallons per month base allowance for the months of September through April and over half of the 71,400 gallons per month in May through August. These allowances are based on the utility rate for a 2 inch water meter.
Cost Estimate:	\$3,809
Priority:	High

Item # 6G-HS	Description
Component:	Multi-user style lavatory basin(s)
Location:	Boy's restroom, girl's restroom, original high school building
Deficiency:	Poor water-flow, no hot water recirculation
Consequence:	Require continuous spray adjustment, cold water only
Photo #6G-HS	
Recommendation:	<p>Remove and replace existing lavatory basin with modern style sensor operated fixture. Install hot water recirculation line or a point of use water heater.</p> <p><b>Low-flow faucets.</b> A standard lavatory sink faucet has a flow rate of 2.5-5 gpm. Redesigned low-flow faucets have reduced this flow rate to 1.5-2.5 gpm while maintaining an adequate flow rate for hand washing. The design of the aerator installed in the outlet mix air into the water as it leaves the faucet, reducing both the flow and the amount of splashing, while increasing wetting efficiency.</p> <p><b>Touchless controls.</b> Touchless controls for restroom faucets have been widely promoted as a means of improving hygiene in restrooms. An infrared sensor detects a user's hands under the faucet and turns on the water. Removing the hands turns off the water flow. Unlike timed and other automatic controls, touchless controls limit water flow.</p> <p><b>Point-of-use water heaters.</b> Traditional building designs rely on a central water-heating system. A centrally located boiler generates hot water, which is distributed through insulated piping. Larger buildings use circulation pumps and large central storage tanks to improve system performance.</p> <p>Systems designed to generate hot water at the point of use employ multiple, smaller water heaters located throughout a facility. Generating hot water at the point of use reduces distribution losses and, just as importantly, water requirements. When hot water is generated in a central system, even in</p>

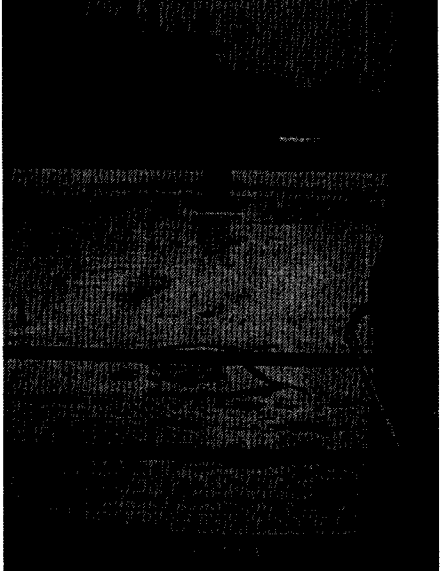
	circulating systems, water must be run for a few seconds before hot water is available to the user. Point-of-use water heaters eliminate this waste of water.
Cost Estimate:	\$18,896
Priority:	Medium

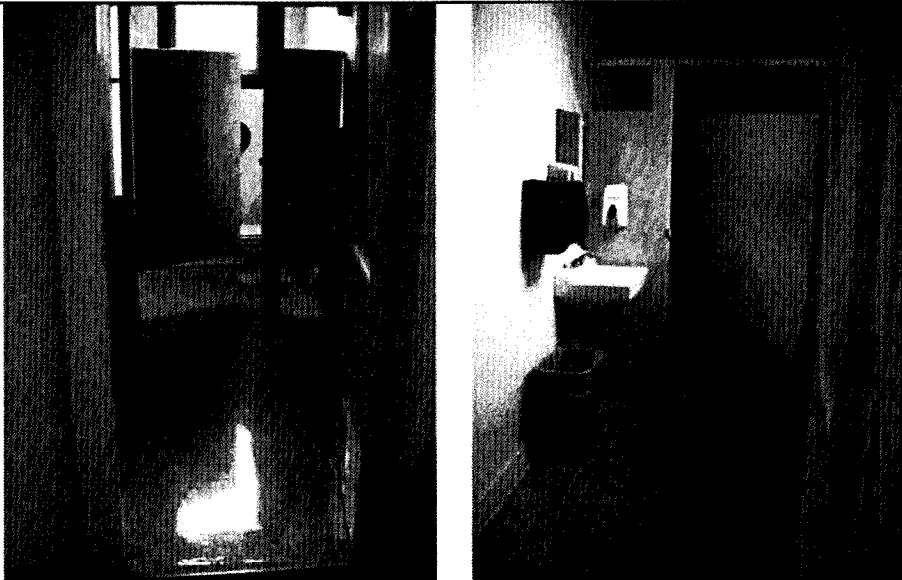
Item # 7G-HS	Description
Component:	Restroom doors
Location:	Shops building; boy's and girl's restroom doors
Deficiency:	Poor quality, poor operational doors
Consequence:	Door do not close or latch properly, mild safety hazard
Recommendation:	Replace existing doors, jams, and frame with new doors with ADA compliant latches.
Cost Estimate:	\$1,027
Priority:	Low



Item # 8G-HS	Description
Component:	Roof drain/roof penetration
Location:	365 sq-ft roof section over weight room
Deficiency:	Significant water damage at interior ceiling in the vicinity of the roof drain penetration (northwest corner of room).
Consequence:	Water damage to building interior ceilings, walls and floor
Photo #8G-HS	
Recommendation:	Investigate cause of roof leakage at roof penetration. Repair and reseal roof as Required. This is an ongoing issue that needs to be monitored. Regular maintenance on the roof will help reduce these issues.
Cost Estimate:	--
Priority:	Medium


Item # 9G-HS	Description
Component:	Gypsum board ceilings
Location:	Central corridor, 1992 south classroom wing addition
Deficiency:	Cracking/separating of gypsum board ceilings adjacent to structural roof framing due to building settlement.
Consequence:	Unsightly appearance, maintenance required
	
Recommendation:	Tape, Texture, and Paint Cracking/Separations.
Cost Estimate:	\$4,654
Priority:	Low


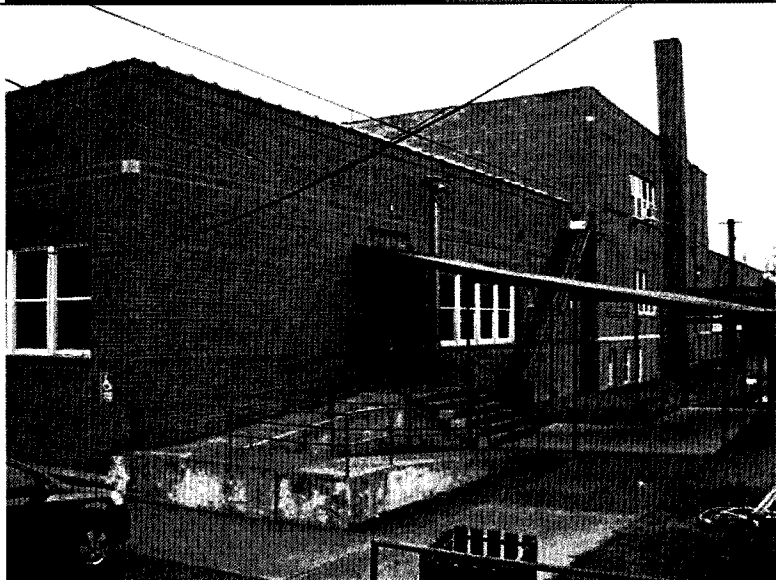
## Junior High School



Item # 1G-JH	Description
Component:	Building roof system
Location:	Refer to Roof Investigation Survey prepared by Benchmark Roof & Pavement Consultants, August 2007
Deficiency:	Various minor repairs/maintenance required. (Refer to roof survey report and roof plan R-2)
Consequence:	Potential water leakage
Photo #1G-JH	
Recommendation:	Follow Recommendations as outlined in Roof Investigation Survey prepared by Benchmark Roof & Pavement Consultants, August 2007. Refer to Report and Appendix roof plan R-2 Annual or semi-annual maintenance is required to extend the life of the roof.
Cost Estimate:	--
Priority:	Medium


Item # 2G-JH	Description
Component:	Handicap accessible and general restrooms
Location 1:	Junior high basement
Location 2:	Junior high southwest entrance adjacent to the auditorium
Deficiency:	The school's existing restroom facilities are currently located in the basement of the 3-level building. A single boy's handicap stall is located in a locked storage closet adjacent to the boy's restroom. The location and configuration of the restrooms do not meet current building codes for accessibility and are not conveniently located for practical use. The quantity of restroom fixtures is not sufficient for the student enrollment and staff.
Consequence:	Non-code compliant, Inconvenient
Photo #2G-JH	
Recommendation:	Provide new restrooms at alternate, handicap accessible location at Junior high school main level. New restrooms shall be ADA compliant, access fixtures and hardware. As identified in Montana Department of Commerce Quality Schools project grant application.
Cost Estimate:	\$1,175,270
Priority:	High


Item # 3G-JH	Description
Component:	Platform, stair climber wheelchair lift
Location:	Central three-story staircase
Deficiency:	Lift is not operational, lift is not code compliant in the U.S., replacement parts are not available.
Consequence:	The school does not have ADA (handicapped access) to the restrooms on the basement level. The school does not have ADA access to the classrooms at the upper level. Furthermore, the existing ADA restroom does not meet ADA requirements as a truly compliant ADA restroom.
Photo #3.1G-JH	
Photo #3.2G-JH	
Recommendation:	Replace wheel chair lift with an elevator. Identify location for the new elevator. As identified in Montana Department of Commerce Quality Schools project grant application.
Cost Estimate:	\$1,175,270
Priority:	High


Item # 4G-JH	Description
Component:	Handicap Access to Entire Facility (Interior Corridor Staircase)
Location:	Main level corridor to auditorium
Deficiency:	No ADA access from main level to auditorium, cafeteria and restrooms. The existing Junior High School was designed without disabilities in mind. The auditorium and lunch room are separated from the rest of the school by a flight of stairs.
Consequence:	Arrangement does not meet ADA access requirements. Wheelchair access from the school's main level to the, auditorium, cafeteria and restrooms is from exterior of the building. Handicapped person must exit the classroom wing at the southwest corner of the building and re-enter at the auditorium.
Photo #4G-JH	
Recommendation:	Replace wheel chair lift with an elevator. Identify location for the new elevator. As identified in Montana Department of Commerce Quality Schools project grant application.
Cost Estimate:	\$1,175,270
Priority:	Medium

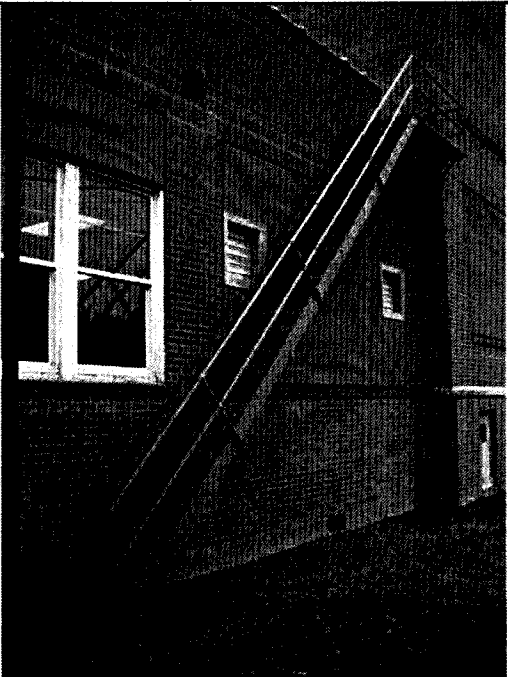
Item # 5G-JH	Description
Component:	Single point entry
Location 1:	Main entrances on Highway 2 side of the building
Deficiency:	Lack of single, supervised entrance to the facility. The original front entrances to the school are not adjacent to the facilities parking on the opposite side of the school.
Consequence:	The existing layout does not give administration control over who is coming and going into the facility.
Photo #5.1G-JH	
Photo #5.2G-JH	
Recommendation:	Add new entry on West side, adjacent to parking lot facility to serve as a single point entry. Restructuring or re-planning of interiors spaces will be required to localize the flow of traffic through the administrative area. Refer to Montana Department of Commerce Quality Schools project grant application.
Cost Estimate:	\$1,175,270
Priority:	Low


Item # 6G-JH	Description
Component:	Exterior concrete entry staircases
Location 1:	Front entry (east)
Location 2:	Auditorium entry (east )
Location 3:	Handicap entry ramp/stair (north)
Deficiency:	Concrete stairs are crumbling and deteriorating
Consequence:	Potential tripping hazard and restricted handicap access.
Photo #6.1G-JH	
Photo #6.2G-JH	
Recommendation:	Construct new cast in place concrete stair with continuous guard rail. Continuous guard rail shall extend the length of the staircase beyond last tread of staircase.
Cost Estimate:	\$16,244
Priority:	Medium

Item # 7G-JH	Description
Component:	Exterior entry staircase
Location 1:	Front entry (east)
Location 2:	Auditorium entry (east )
Deficiency:	Handrails do not extend past the last tread of the staircase.
Consequence:	Not ADA code compliant, safety hazard
Photo #7G-JH	
Recommendation:	Construct new continuous guard rails to extend beyond last tread of staircase.
Cost Estimate:	\$4,284
Priority:	Medium



Item # 8G-JH	Description
Component:	Exterior entry doors
Location 1:	Front entry (east)
Location 2:	Auditorium entry (east )
Location 3:	Auditorium entry (west )
Location 4:	Handicap entry (north)
Deficiency:	Poor quality, poor operational doors. Some of the components are dysfunctional, but the doors are intact. Some of the door frames are split or separating from the wall. Doors are old as is the panic hardware. Lack of sufficient weather stripping and poor seals. All entry doors have antiquated, non-ADA compliant door hardware
Consequence:	Door do not close or latch properly, slam shut hard, mild safety hazard. Lack of weather stripping and poor seals result in wasted energy due to air infiltration.
Photo #8G-JH	
Recommendation:	Replace existing doors and frames with modern energy efficient doors with weather stripping, and ADA panic hardware. Replacing the doors will help reduce energy lose, provide for better security and access, function better, and provide an aesthetic improvement.
Cost Estimate:	\$22,360
Priority:	High

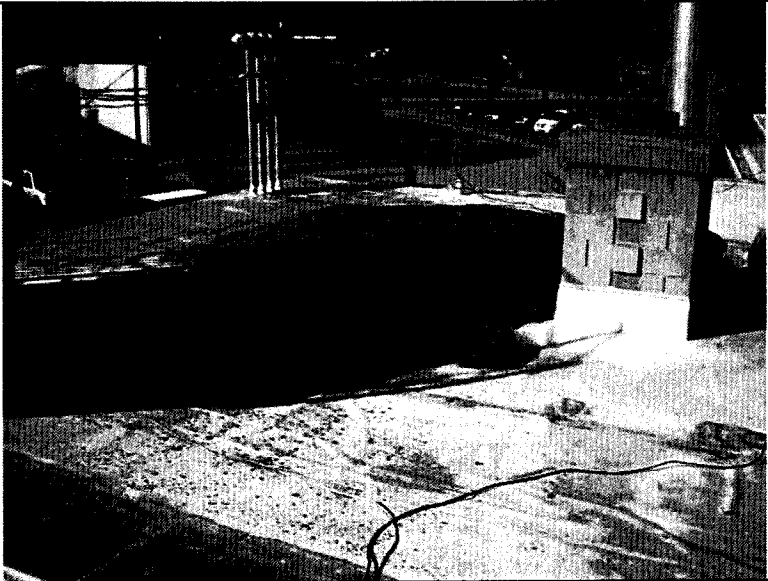
Item # 9G-JH	Description
Component:	Furred window openings
Location:	Multiple window openings throughout the entire building
Deficiency:	Windows are partially or completely covered
Consequence:	Unsightly appearance, Reduced natural light transmission
Photo #9G-JH	
Recommendation:	<p>Remove and replace furred covered windows with a combination of thermally efficient double pane glass and a high R-Value translucent Kal-Wall system.</p> <p>The furred windows would be replaced with a high-performance translucent "Kalwall®" building panel assembly. The Kalwall panels offer superior thermal performance (R-Values as high as 20) while allowing light to diffuse into the building. This diffused light provides natural day-lighting without sacrificing energy efficiency. A side benefit of the Kalwall panels would be the improvement in natural "day-lighting". In addition to brightening up the space, day-lighting can assist with reducing energy cost by minimizing the need for electrical lighting.</p> <p>The window replacement will also improve the building aesthetics. Restoring the building to its historical appearance.</p>
Cost Estimate:	\$125,151
Priority:	Low



Item # 10G-JH	Description
Component:	Third floor fire escape
Location:	Northwest corner of Junior High Building
Deficiency:	Fire escape staircase is not sufficiently fastened to structure
Consequence:	Potential collapse of staircase under excessive live loading
Photo #10G-JH	
Recommendation:	Evaluate and identify proper securing of existing emergency staircase to building structure.
Cost Estimate:	\$910
Priority:	High

<b>Item # 11G-JH</b>	<b>Description</b>
<b>Component:</b>	Single pane windows at building entryways
<b>Location 1:</b>	Front entry (east)
<b>Location 2:</b>	Auditorium entry (east)
<b>Deficiency:</b>	Single pane windows.
<b>Consequence:</b>	Single Pane window provide minimal thermal resistance
<b>Photo #11G-JH</b>	
<b>Recommendation:</b>	<p>Remove and replace single pane windows with custom thermally efficient double pane glass.</p> <p>The proposed replacement for the entry would be to replace the single pane windows with double-pane low-e glass. The new windows would improve the thermal efficiency of the glass and window framing.</p> <p>Custom windows would maintain the aesthetics of the historic building.</p>
<b>Cost Estimate:</b>	\$8,723
<b>Priority:</b>	Low

## Elementary School

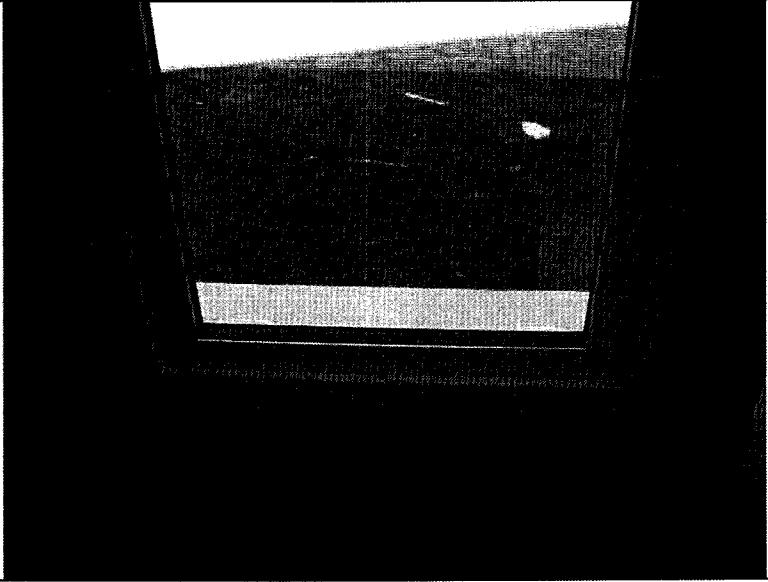
Item # 1G-EL	Description
Component:	Building roof system
Location:	Refer to Roof Investigation Survey prepared by Benchmark Roof & Pavement Consultants, August 2007
Deficiency:	Various water ponding problems, Punctured/damaged roof membrane, Missing roof drain strainers, Cracks in skylights (Refer to roof survey report and roof plan R-1)
Consequence:	Some observable water leakage and other potential water leakage
Photo #1.1G-EL	
Photo #1.2G-EL	
Recommendation:	Follow Recommendations as outlined in Roof Investigation Survey prepared by Benchmark Roof & Pavement Consultants, August 2007. Refer to Report and Appendix roof plan R-1. Annual or semi-annual maintenance is required to extend the life of the roof.
Cost Estimate:	--
Priority:	Medium

Item # 2G-EL	Description
Component:	Structural settlement of roof system
Location:	Roof over boiler room
Deficiency:	Structural settlement of supporting roof elements due to water-weight associated with roof ponding and/or increased loading of structural roof members from suspended mechanical/electrical services in boiler room below. Observable cracking and/or separating of plasterboard ceiling sheeting in boiler room.
Consequence:	Potential roof collapse in boiler room under heavy snow loading
Photo #2G-EL	
Recommendation:	<p>Preliminary recommendation is to have a Licensed Structural Engineer to conduct a site evaluation and structural investigation of the roof and support structure.</p> <p>Reconstruction Recommendation: Demo existing roof and support structure above boiler room and reconstruct new engineered roof support with new roof drainage, insulation, membrane, and fire rated ceiling.</p>
Cost Estimate:	<p>\$2,500 (Site Evaluation and Report)</p> <p>\$31,869 (For Reconstruction)</p>
Priority:	High

Item # 3G-EL	Description
Component:	Skylights
Location:	Central corridors of original portion of the building
Deficiency:	Cracked plexi-glass domes or leaking seals. Poor quality product with minimal thermal resistance.
Consequence:	Observable water leakage at interior ceilings adjacent to skylights. Excessive heat loss/heat gain as a result of poor quality skylight.
Photo #3.1G-EL	
Photo #3.2G-EL	
Recommendation:	<p>Remove and replace sixteen (16) existing poor efficiency dome skylights with modern thermally efficient translucent skylights.</p> <p>Skylights typically result in 35%-45% greater heat losses during cold weather compared to windows of that same material, construction, and sizes. Increased convection and radiation heat transfers and the increased surface area associated with the skylight curb all contribute to this increase in energy loss. Skylight can be made of glass or a variety of plastics. Glass while more durable is limited to a flat or planar shape. The dome or ridge shaped</p>


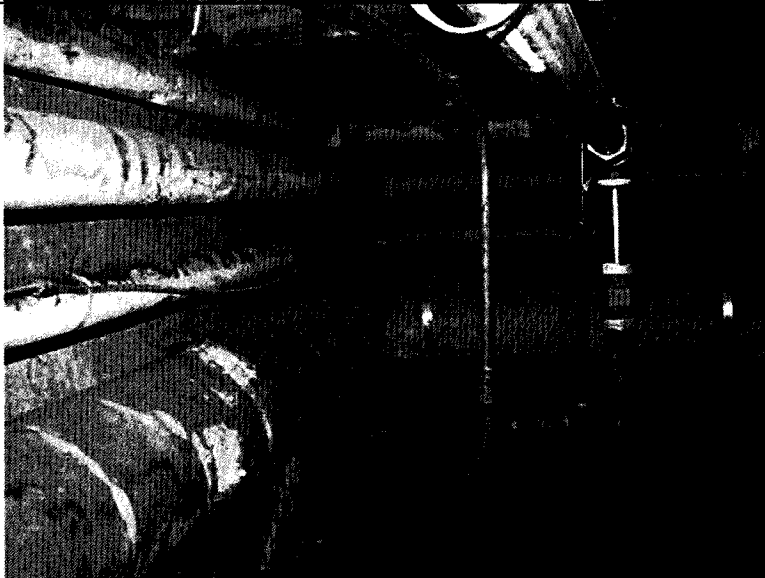
	<p>skylights are made of molded plastic. The molded plastic does not have the energy performance that glass can offer. Shaped skylights also have a larger surface area, thus resulting in greater heat losses over the size of the skylight opening. Modern, thermally-efficient skylights can minimize heat losses while provided lighting energy savings by allowing for natural "daylighting".</p> <p>Replace the buildings sixteen (16) skylights with energy efficient translucent panel "Kalwall®" skylights. The translucent panels offer superior thermal performance (R-Values as high as 20) while allowing light to diffuse into the building. This diffused light provides natural day-lighting without sacrificing energy efficiency.</p>
Cost Estimate:	\$13,605
Priority:	Medium

Item # 4G-EL	Description
Component:	Tile floor transition
Location:	Corridor at south building wing (4-classroom addition)
Deficiency:	Flooring uplifting
Consequence:	Potential tripping hazard
Recommendation:	Demo a portion of the existing tile floor system, grind and/or level concrete expansion joint, and reconstruct to new floor tile system to match.
Cost Estimate:	\$2,500
Priority:	Low


Item # 5G-EL	Description
Component:	New operable classroom window sections
Location:	Classrooms original to the 1960's era construction (excludes 4 classroom addition at the southeast)
Deficiency:	Operable window sections were installed in 2009, as part of the Quick-Start Energy Grant program. These windows were set without proper caulking, sealing and trimming. Large gaps exist between the new window frames and the rough openings.
Consequence:	Poor energy efficiency due to outdoor air infiltration.
Photo #5G-EL	
Recommendation:	Provide weather stripping and/or spray foam weather sealing to existing air gaps at recently replaced window sections. Finish with trim and caulk, paint to match.
Cost Estimate:	--
Priority:	High

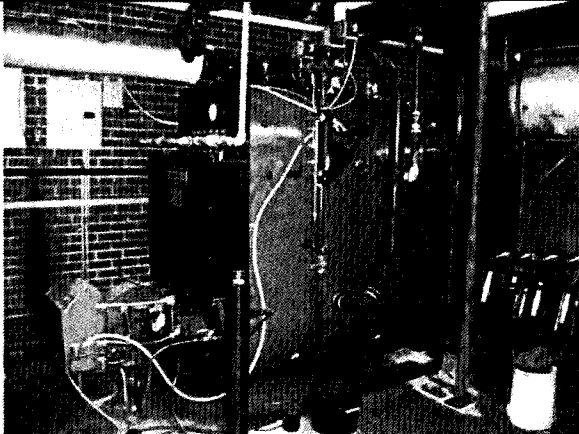
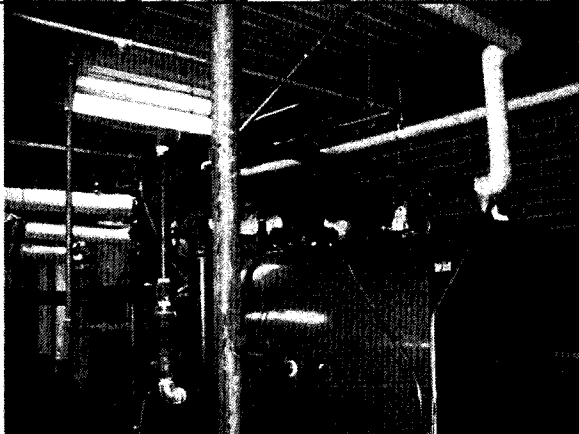
## MECHANICAL SYSTEMS DEFICIENCIES



### High School

Item # 1M-HS	Description
Component:	Steam condensate pump and associated piping fittings
Location 1:	The southeast corner of the gym near crawlspace floor access
Location 2:	The steam tunnel entrance from the boiler room at the southwest corner of the gym
Deficiency:	Various steam and steam condensate return piping fittings are leaking steam and condensate into the crawlspace.
Consequence:	Moisture accumulation/saturation of soil resulting in potential mold growth and/or damage to floor system and supporting floor structure. Excessive operation of the crawlspace humidity remediation fan/ventilation system resulting in wasted energy and reduced equipment life.
Photo #1.1M-HS	
Photo #1.2M-HS	
Recommendation:	Replace existing leaking steam and condensate lines with new insulated piping. Replace existing steam condensate pump or seals on condensate

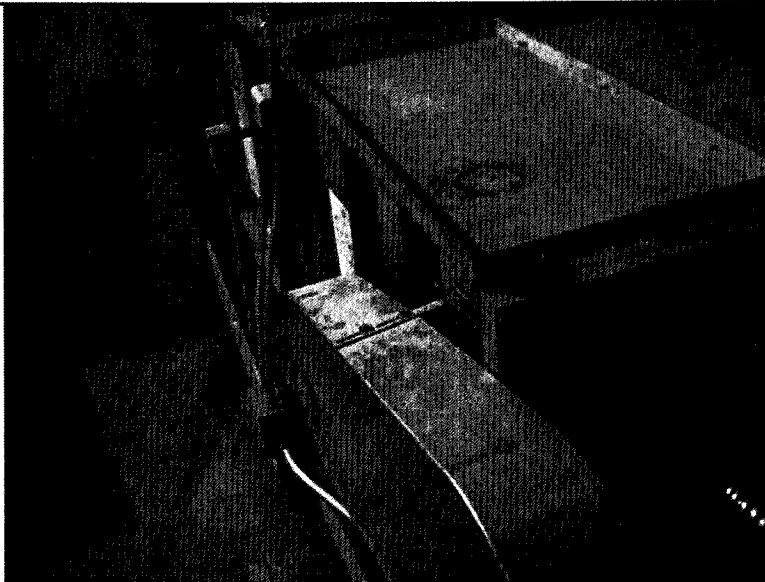
	pump located at crawl space entrance to gymnasium. Replace leaking steam traps, fittings, and steam heating devices throughout system. Strong consideration should be given to replacing the steam system with a high efficiency hot water boiler and piping system. Refer to item # 3M-HS.
Cost Estimate:	\$33,300
Priority:	High

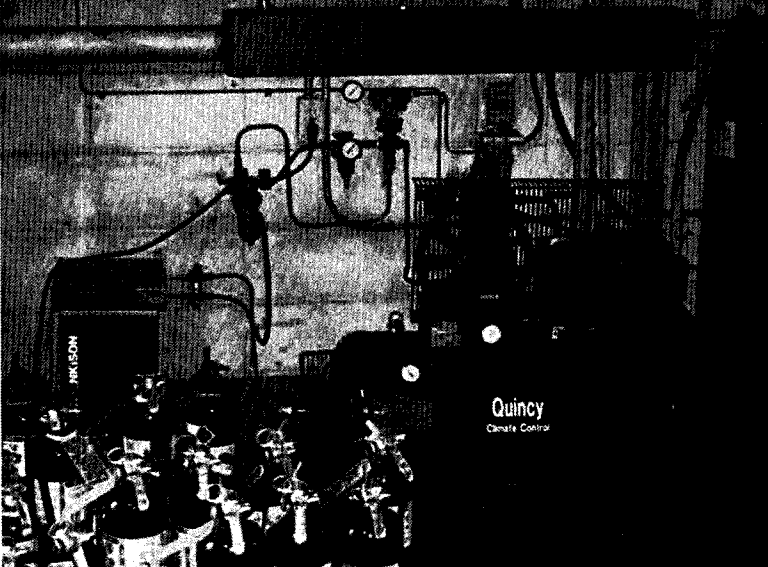
Item # 2M-HS	Description
Component:	Finned-tube steam radiator
Location:	Gymnasium (south wall)
Deficiency:	Not functioning
Consequence:	The gym is currently being heated by the single finned tube unit on the north side which is 50% of the original heating capacity.
Photo #2.1M-HS	
Photo #2.2M-HS	
Recommendation:	The first recommendation would be to remove the control valve to the finned-tube steam radiator to investigate as a likely cause of failed operation. Replace control valve if this is determined to be the cause. If the investigation finds the control valve to be working correctly, consideration should be given to replacing the existing system with a new system. Demo existing steam fin tube radiators and associated piping. Provide new ducted air handler unit suspended from roof structure in gymnasium. The new air handler would include a hot water coil, modern comfort controls, and outdoor ventilation air connections. The new system would provide for balanced comfort and better ventilation in the gymnasium.
Cost Estimate:	\$42,086
Priority:	Medium

Item # 3M-HS	Description
Component:	High School steam heating plant
Location:	Mechanical room, original high school building
Deficiency:	The existing boiler burns #2 diesel heating oil. Heating oil as a fuel source has become extremely costly with modern fuel rates.
Consequence:	High heating costs
Photo #3.1M-HS	
Photo #3.2M-HS	
Recommendation:	<p>Convert fuel heating oil to liquid propane. Replace boiler burners and fuel oil distribution system. It is strongly recommended that the steam system be entirely converted over to hot water. Refer to Item # 4M-HS. Remove existing underground fuel oil tank and replace with new underground propane tank at same location.</p> <p>Although propane has a lower heating value per gallon than #2 heating fuel-oil (91,500 Btu/gal as compared to 138,700 Btu/gal), the cost per gallon is significantly less. For propane, the heating value is 65,357 BTU per dollar using a current estimated cost of \$1.40/gal, as compared to diesel which is 51,370 BTU per dollar current estimated cost of \$2.70/gal.</p> <p>The cost saving associated with switching from fuel-oil to propane is estimated to be \$7,200 per year using the rates shown above.</p>
Cost Estimate:	\$30,185
Priority:	Low

Item # 4M-HS	Description
Component:	High School steam heating boiler and devices
Location:	Original portion of high school building which includes the gymnasium, boys/girls locker rooms and 4 classrooms.
Deficiency:	The 60+ year old steam heating devices, condensate return pumps, piping & components are beyond their useful life and are leaking/failing and in need of replacement.
Consequence:	Inefficient/unreliable heating, demand constant maintenance
Photo #4.1M-HS	
Photo #4.1M-HS	
Recommendation:	<p>Replace existing fuel oil steam boiler plant with a new high efficiency propane fired condensing gas, hot water boiler plant. This conversion would involve replacing all steam heating devices which include; gymnasium fin tube units, four classroom unit ventilators, and boys and girls locker room unit ventilators.</p> <p>The existing boiler is a conventional, non-condensing unit which loses a significant amount of heat to the atmosphere. The hot combustion gases</p>

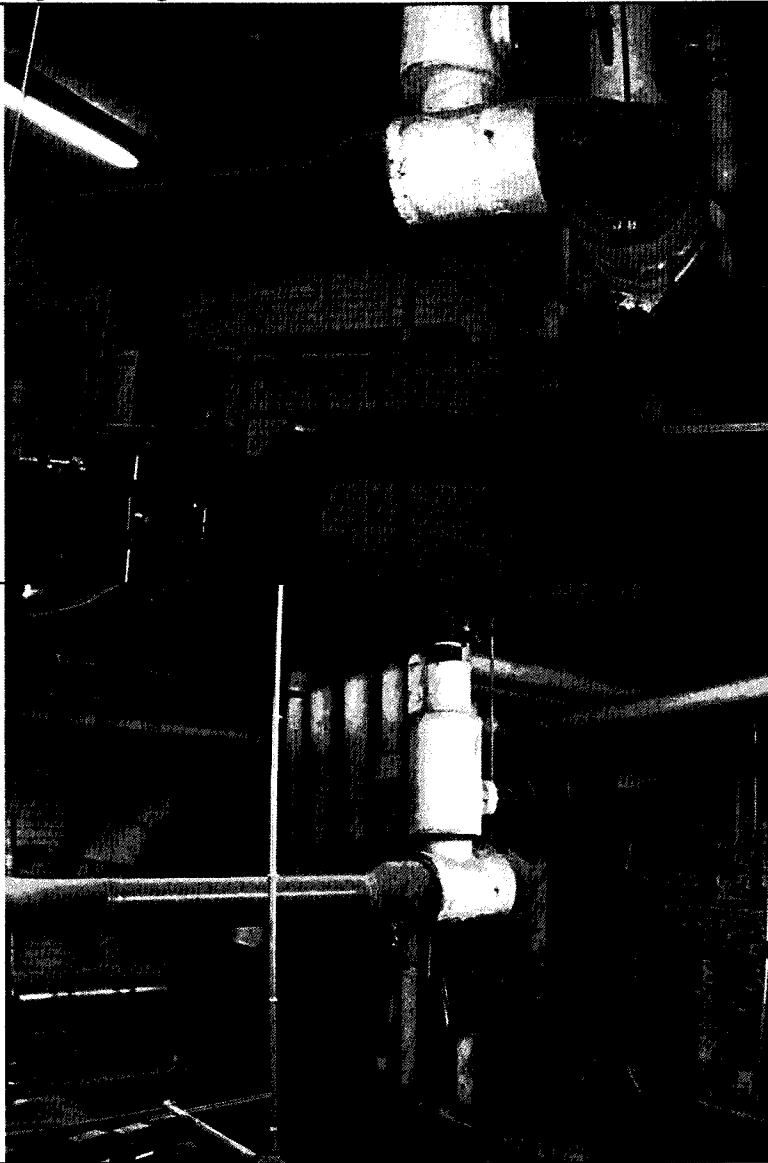
	<p>from the burning of fuel to heat water contained in a heat exchanger are wasted through the vent stack.</p> <p>The proposed replacement boilers would be properly-sized, premium-efficiency, condensing gas units capable of full modulation with a 5 to 1 turndown ratio or higher. The new boilers would be capable of achieving a maximum operating efficiency of 96%.</p> <p>In a condensing boiler working at peak efficiency, the water vapor produced by the burning fuel in the boiler is condensed back into liquid water. Provided the returning water is sufficiently cool, the steam condenses to liquid water. Some of the extra efficiency of the condensing boiler is due to the cooling of the exhaust gases, but the majority of the energy recovered is from the condensation of the water vapor in the exhaust gases. This releases the latent heat of vaporization of the water into the heat exchanger.</p> <p>In addition, modern condensing boilers have microprocessor-controlled combustion that modulates the quantity of gas/air fuel mixture which is supplied to the burner using an algorithm that considers outdoor air temperature, water temperatures supplied and returned to the boiler, and time at a specific temperature. Sophisticated algorithms learn the building requirements at specific outdoor air temperatures, more successfully returning cool water that condenses the vented exhaust gases and recovering the heat of vaporization. Modulating control units also minimize on-off cycling to increase efficiency. They attempt to supply only the amount of heat to the building that the building loses at a specific outdoor air temperature.</p> <p>Although propane has a lower heating value per gallon than diesel (91,500 Btu/gal as compared to 138,700 Btu/gal), the cost per gallon is significantly less. For propane, the heating value is 65,357 BTU per dollar using a current estimated cost of \$1.40/gal, as compared to diesel which is 51,370 BTU per dollar current estimated cost of \$2.70/gal.</p> <p>The cost saving associated with switching to propane and replacing the boiler with a high efficiency boiler is estimated to be \$16,561 per year using the fuel prices listed above.</p>
Cost Estimate:	\$239,346
Priority:	Medium

Item # 5M-HS	Description
Component:	Central air-handler; fan belt, sheaves and bearings
Location:	Shops building attic
Deficiency:	Rotating fan/motor imbalance
Consequence:	Noise, unreliable service life
Photo #5M-HS	
Recommendation:	<p>Replace fans, sheaves, belts, and bearings in existing air handling unit. Rebalance existing air system.</p> <p>By replacing the fans, sheaves, belts, and bearings in the existing air handling unit is will be return to its original state.</p>
Cost Estimate:	\$1,417
Priority:	High

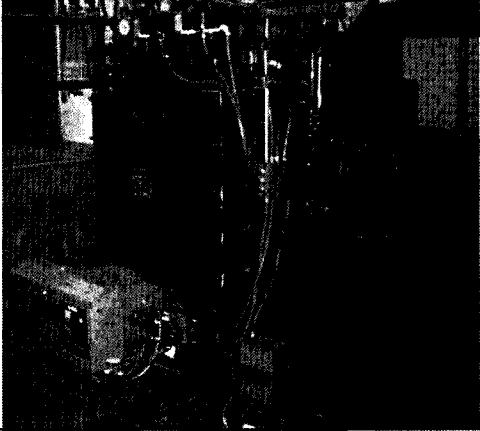

Item # 6M-HS	Description
Component:	Central heating system's pneumatic controls
Location:	Entire facility, classrooms, offices and boiler room
Deficiency:	Antiquated system, requires air compressor, has limited control features
Consequence:	Inefficient operation, limited user control strategies
Photo #6M-HS	
Recommendation:	<p data-bbox="451 909 1445 947">Replace existing pneumatic controls with modern direct digital controls.</p> <p data-bbox="451 989 1445 1262">This recommendation would involve replacing the existing pneumatic controls systems and components with a modern, computer-based, direct-digital control (DDC) energy management control system (EMCS). DDC systems improve performance by; control precision, systems coordination, optimum start, outdoor air reset, demand controlled ventilation, diversity analyses, system load tracking, monitoring and maintenance information, trend information and history data.</p> <p data-bbox="451 1304 1445 1766">DDC EMCSs replace conventional pneumatic or electromechanical HVAC control systems with equipment capable of performing not only control but energy management and system diagnostic functions in the environment of a centralized computer network. An EMCS accepts analog, discrete, and digital input from remote sensors and devices, processes the data, and then controls remote mechanical equipment. An EMCS inherently has more accurate control because it reduces the drift, maintenance and recalibration problems common with pneumatic control systems. Additionally, an EMCS can make all facilities function more efficiently when the gathered data are compiled into useful, pertinent reports. Quality control, production, research, and maintenance will all benefit from the increased information flow when it is properly managed.</p> <p data-bbox="451 1808 1445 1948">Conventional pneumatic and electric control employs subsystems and components that traditionally operate without the coordination and sharing of information available with DDC systems. DDC systems integrate subsystems and components to work together, to share information, and to</p>

	<p>maximize energy efficiency of the environmental conditioning system. This integration of subsystems maximizes energy efficiency by reducing energy-wasting operating times and conflicting zone conditioning requirements.</p> <p>Sold-state sensors and controllers used in DDC systems have considerable energy-efficiency advantages over conventional pneumatic systems. Substantial advantages are realized in calibration and maintenance, but the critical value lies in the accuracy and reliability of the DDC systems. These features can yield operational energy savings of 15% and greater when compared to the conventional pneumatic system. The inherently precise positioning of control devices with EMCS control loops and blocks are responsible for these energy savings.</p> <p>A DDC system can provide daily building warm-up using temperature sensors in all building zones. A calculation program is used to determine the optimum time to start warm-up, with significant differences from the pneumatic control method. The DDC software allows the operator/manager to gain instant, system-wide access and control from a single computer.</p> <p>Energy savings associated with the implementation of DDC controls has been documented to reduce electric and/or fuel costs by 20% to 50%, and maintenance costs by 40% or more.</p>
Cost Estimate:	\$81,027
Priority:	Low

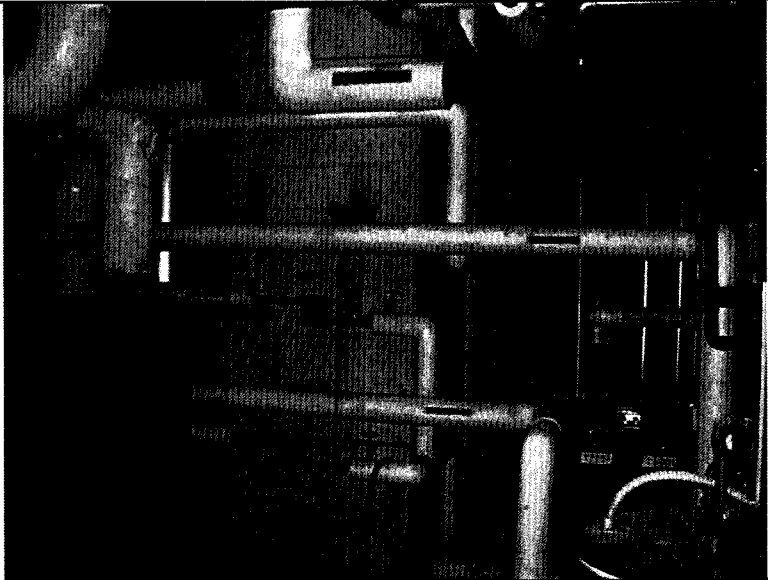
## Junior High School

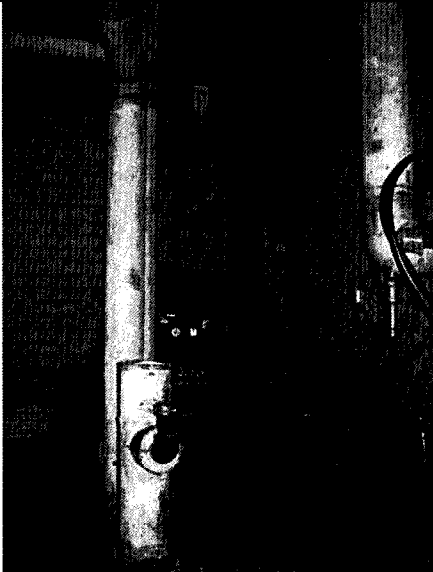
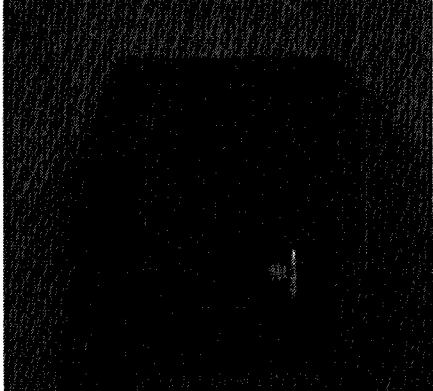
Item # 1M-JH	Description
Component:	Junior High School steam heating plant
Location:	Mechanical room, Junior High School Basement
Deficiency:	The existing boiler burns #2 diesel heating oil. Heating oil as a fuel source has become extremely costly with modern fuel rates.
Consequence:	High heating costs
Photo #1.1M-JH	
Photo #1.2M-JH	
Recommendation:	<p>Convert fuel heating oil to liquid propane. Replace boiler burners and fuel oil distribution system. It is strongly recommend that the steam system be entirely converted over to hot water. Refer to Item # 2M-JH. Remove existing underground fuel oil tank and replace with new underground propane tank in same place.</p> <p>Although propane has a lower heating value per gallon than diesel (91,500 Btu/gal as compared to 138,700 Btu/gal), the cost per gallon is significantly less. For propane, the heating value is 65,357 BTU per dollar using a current</p>

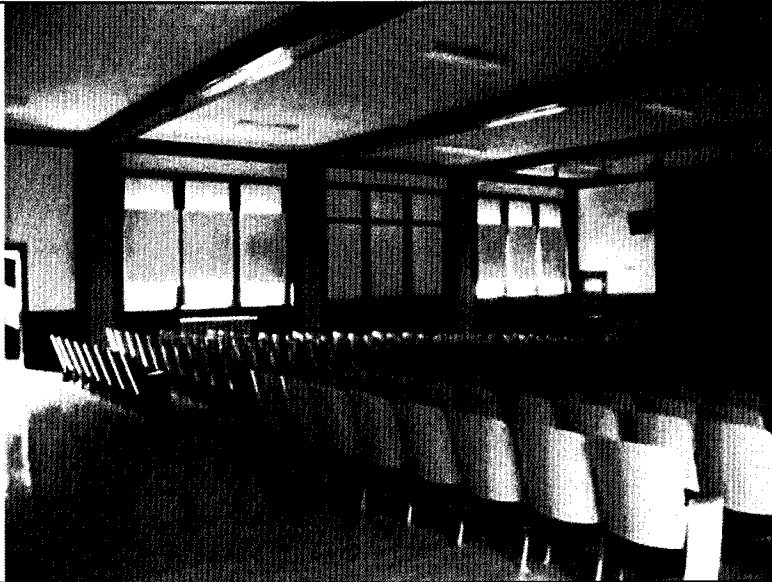
	<p>estimated cost of \$1.40/gal, as compared to diesel which is 51,370 BTU per dollar current estimated cost of \$2.70/gal.</p> <p>The cost saving associated with switching from fuel-oil to propane is estimated to be \$7810 per year using the rates listed above.</p>
Cost Estimate:	\$29,144
Priority:	Low


Item # 2M-JH	Description
Component:	Junior High School steam heating boiler, unit ventilators, radiators, piping and devices
Location:	Classrooms and entire Junior High School Building
Deficiency:	The 93 year old steam heating devices, piping & components are beyond their useful life and are in need of replacement.
Consequence:	Inefficient/unreliable heating, demand constant maintenance
Photo #2.1M-JH	
Photo #2.2M-JH, #2.3M-JH,	
Recommendation:	<p>Replace existing fuel oil steam boiler plant with a new high efficiency propane fired condensing gas hot water boiler plant. This conversion would be replace all steam heating devices; classroom unit ventilators, cabinet unit heaters, and associated piping.</p> <p>Refer to #4-HS for further explanation of recommendation.</p> <p>Although propane has a lower heating value per gallon than diesel (91,500 Btu/gal as compared to 138,700 Btu/gal), the cost per gallon is significantly less. For propane, the heating value is 65,357 BTU per dollar using a current estimated cost of \$1.40/gal, as compared to diesel which is 51,370 BTU per dollar current estimated cost of \$2.70/gal.</p> <p>The cost saving associated with switching to propane and replacing the boiler with a high efficiency boiler is estimated to be \$17,710 per year using the rates listed above.</p>
Cost Estimate:	\$386,283
Priority:	Low

## Elementary School

Item # 1M-EL	Description
Component:	Elementary School steam heating piping, steam traps and devices
Location:	Thirteen of the school's nineteen classrooms have steam heating unit ventilators fed from piping in tunnels below grade.
Deficiency:	The 47+ year old steam heating devices, piping & components are antiquated. Some of the steam traps in the tunnels are failing and require attention or replacement.
Consequence:	Unreliable heating, high maintenance demand
Photo #1M-EL	
Recommendation:	<p>Investigate and repair faulty steam traps at existing unit ventilators and in the steam tunnels.</p> <p><b>Maintenance of steam traps</b>  Source of the following information is from Spirax Sarco (<a href="http://www.spiraxsarco.com">www.spiraxsarco.com</a>)</p> <p><b>Routine maintenance</b>  Routine maintenance depends on the type of trap and its application. The balanced pressure steam trap for example, has an element which is designed for easy replacement. Changing these on a regular basis, maybe once every three years or so, might seem wasteful in time and materials. However, this practice reduces the need for trap checking and should ensure a trouble free system with minimal losses through defective traps.</p> <p>Routine maintenance which involves cleaning and re-using existing internals uses just as much labor but leaves an untrustworthy steam trap. It will have to be checked from time to time and will be prone to fatigue. Any routine maintenance should include the renewal of any suspect parts, if it is to be cost effective.</p>

Item # 3M-JH	Description
Component:	Central heating system's pneumatic controls
Location:	Entire facility, classrooms, offices and boiler room
Deficiency:	Antiquated system, requires air compressor, has limited control features
Consequence:	Inefficient operation, limited user control strategies. No night set-back or operational schedule or energy management functions resulting in wasted energy.
Photo #3.1M-JH	
Photo #3.2M-JH	
Recommendation:	Replace existing pneumatic controls with modern direct digital controls.  See Item #6M-HS for further explanation of replacing existing pneumatic controls with modern direct digital controls.
Cost Estimate:	\$88,479
Priority:	Low

Item # 4M-JH	Description
Component:	Ventilation air systems
Location:	Auditorium
Deficiency:	Outdoor ventilation/relief air systems abandon or inoperable. Code required ventilation air rates for this type of space are 7.5 CFM/person, 10 sq-ft/person. For the 3060 sq-ft auditorium the required ventilation rate is 306 CFM.
Consequence:	No active fresh air ventilation systems for occupants. Ventilation air is required for school's assembly halls/auditoriums per ANSI/ASHRAE standard 62.1.
Photo #4M-JH	
Recommendation:	Replace existing steam convector units with new ducted air distribution system. New air handler will include steam or hot water heating coil, modern comfort controls, demand controlled ventilation, and outside ventilation air connection. New air handler could possibly be located in structural space above the auditorium.
Cost Estimate:	\$33,949
Priority:	Low

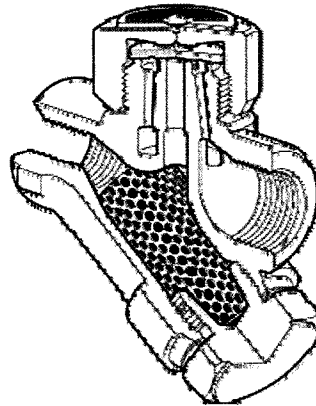
Item # 5M-JH	Description
Component:	4 Original 1950's era, steam-unit ventilators
Location:	4 classrooms in the original, central classroom
Deficiency:	Units are beyond their life-expectancy
Consequence:	Units are unreliable and not energy efficient
Photo #5M-JH	
Recommendation:	<p>Remove and replace existing unit ventilators with new classroom ventilators. The new units could utilize the existing steam or be converted to hot water and tied into existing boiler system.</p> <p>Unit ventilators have been used for classroom comfort and learning productivity for over 80 years. New unit ventilators are 65% quieter than previous models and deliver extra cooling capacity for the added ventilation requirements prescribed by American Society of Heating, Refrigerating and Air-Conditioning (ASHREA) Standards. Unit ventilators draw-through design with face and bypass damper control provide superior temperature and dehumidification control. New unit ventilator can be tied into Direct Digital Controls (See Item # 3M-JH). Additional features include, economizer, demand control ventilation (DCV) and part load, variable air options that allow you to reduce operating costs while closely matching classroom comfort requirements</p>
Cost Estimate:	\$32,535
Priority:	Medium

### **Replacement of Internals**

The renewal of internal parts of a steam trap makes good sense. The body will generally have as long a life as the plant to which it is fitted and it is only the internal parts which wear, depending on system conditions. There are obvious advantages in replacing these internals from time to time. It depends on the ease with which the new parts can be fitted and the reliability and availability of the refurbished trap. The elements of thermostatic traps can generally be changed by removing a screwed in seat. Replacement is simple and the remade trap will be reliable assuming the maintenance instructions are correctly carried out.

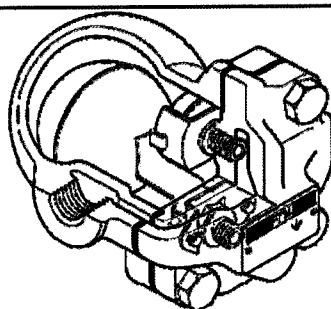
If the seat or disc faces of a thermodynamic trap become damaged, the disc can simply be replaced (Figure 11.14.6). Damage to seating faces can be rectified by lapping gently. Replacing the seats of some higher pressure thermodynamic traps is more complicated. Two separate gasketed joints may have to be made or a single gasket may have to cope with two or more steam/condensate passages. The weakest point is often the joint between trap body and seat, particularly if this has been allowed to blow steam.

Always check with the manufacturer regarding the correct technique for any maintenance work required on steam traps. A reputable manufacturer will always be able to supply appropriate literature, advice, and spare parts.



**Fig. 11.14.6 Sectional view of a thermodynamic trap with the disc as one moving part**

A lot will depend on site conditions. The small float trap, shown in Figure 11.14.7, is designed so that the cover with the internals attached can be taken to the workshop, leaving the main body attached to the pipe. This is often preferable to renewing the seats of inaccessible traps, which have been welded into the pipe work under dirty site conditions.

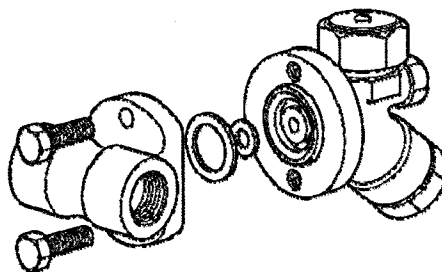


**Fig. 11.14.7 Internals of float-thermostatic trap with steam lock release and air vent**

#### **Replacement of traps**

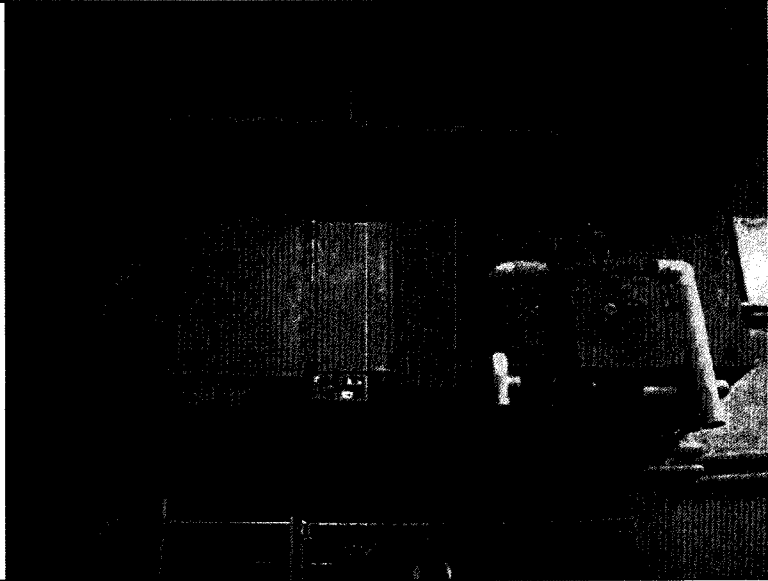
On occasions, it will be easier and cheaper to replace traps rather than repair them. In these cases it is essential that the traps themselves can be changed easily. Flanged connections provide one solution, although the flanged trap is more expensive than the equivalent screwed trap. Mating flanges are an additional expense.

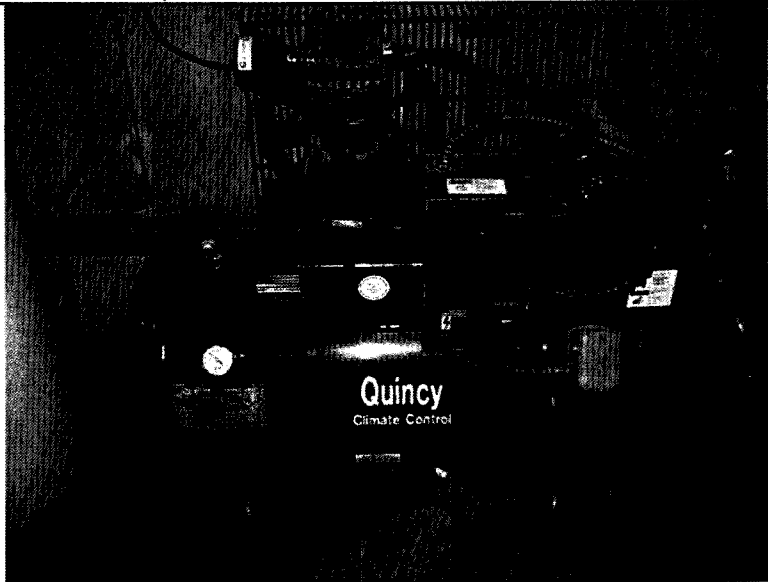
A swivel connector allows rapid easy removal and replacement of the sealed trap. The trap shown in Figure 11.14.8 is specifically designed for easy replacement for such a system. It comprises a pipeline unit or connector which remains in the pipeline during the maintenance procedure. The trap can be replaced simply by attending to two bolts. This type of trap can be matched to the same connector providing flexibility of choice and rationalization of spares. Connectors are also available with integral piston isolation valves ensuring downtime is kept to a minimum.




**Fig. 11.14.8 Swivel connector trap for quick replacement**

Cost Estimate:	\$4,485
Priority:	Medium

Item # 2M-EL	Description
Component:	Air-handling unit, steam heating coil
Location:	Gymnasium air-handling unit
Deficiency:	Condensate leaks at steam trap (downstream of trap on condensate return side). Inadequate heat exchange due to probable sediment clogging of heating coil. Problem occurred after the first year of operation. The coil was installed as part of the 2005 energy improvements project.
Consequence:	Moisture damage to gym flooring, poor heat transfer at coil resulting in extended run time and inefficient operation.
Photo #2M-EL	
Recommendation:	Investigate steam coil for possible sediment buildup and clean or replace as required. Install appropriate filters and strainers and repair cause of moisture leak at condensate return.
Cost Estimate:	\$2,028
Priority:	Medium

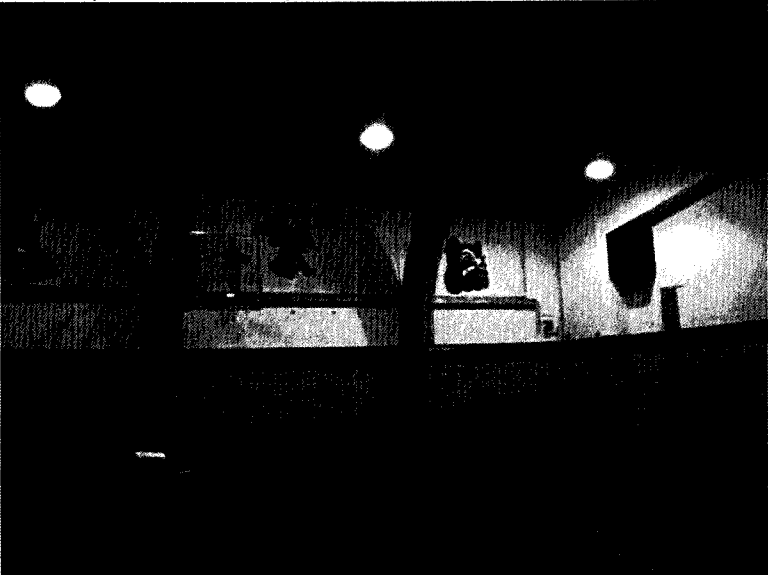
Item # 3M-EL	Description
Component:	Central heating system's pneumatic controls
Location:	Entire facility, classrooms, offices and boiler room
Deficiency:	Antiquated system, requires air compressor, has limited control features
Consequence:	Inefficient operation, limited user control strategies
Photo #3M-EL	
Recommendation:	<p>Replace existing pneumatic controls with modern direct digital controls.</p> <p>See Item #6M-HS for further explanation of replacing existing pneumatic controls with modern direct digital controls.</p>
Cost Estimate:	\$124,187
Priority:	Low

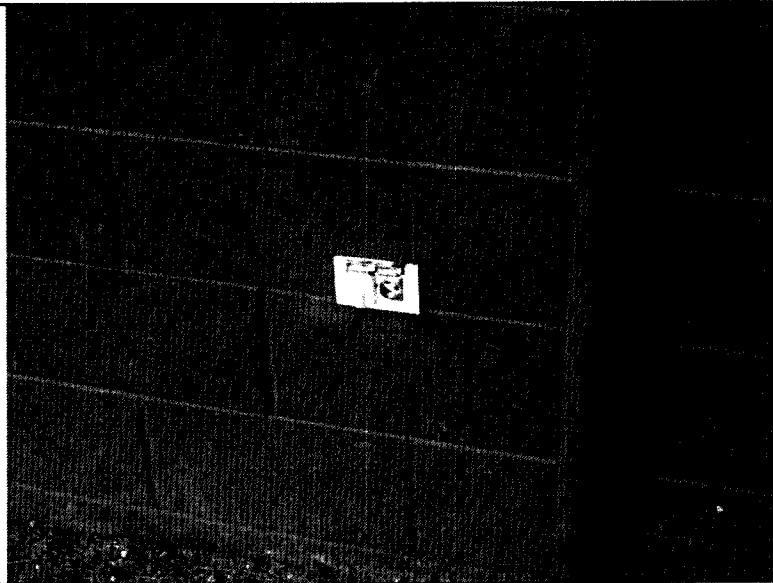
Item # 4M-EL	Description
Component:	Kitchen freezer refrigerant piping to exterior condenser
Location:	Northwest (front) exterior wall of gymnasium
Deficiency:	Improper piping insulation
Consequence:	Excessive frost accumulation on piping resulting in reduced equipment performance, equipment life and operating efficiency.
Photo #4M-EL	
Recommendation:	Install insulation and weather jacket to all piping. We also recommend that the refrigerant charge level be evaluated by a refrigeration technician.
Cost Estimate:	\$1,106
Priority:	High

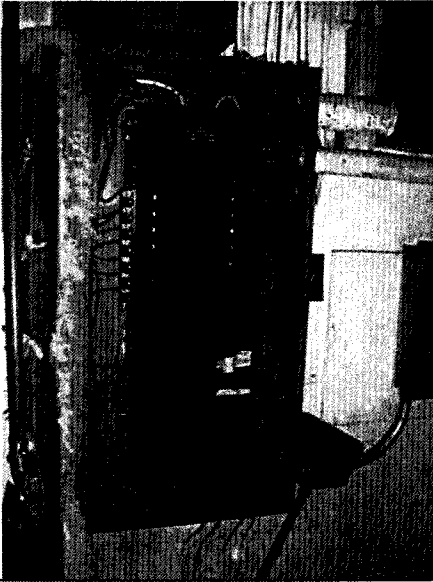
## ELECTRICAL SYSTEMS DEFICIENCIES

### High School

Item # 1E-HS	Description
Component:	Egress Lighting
Location:	Building Interior and Exterior
Deficiency:	Lacking emergency egress lighting.
Consequence:	Code violation and life safety hazard in the event of power loss. Per IBC 1006.3, in the event of a power failure, an emergency electrical system shall automatically illuminate exterior landings for exit discharge doorways in buildings that have two or more exits.
Recommendation:	Install new exterior luminaire with remote mounted battery or exterior emergency lighting with integral battery rated for cold weather. Install emergency egress lighting as required by code. This can be done by utilizing combination exit signs/lighting units or possibly retrofitting luminaires in the egress path with battery ballasts. Exterior egress lighting can be achieved by utilizing a low voltage remote head or installing new wall pack with a line voltage lamp as intended for normal use with low voltage lamping and remote battery for emergency use.
Cost Estimate:	\$9,656
Priority:	High

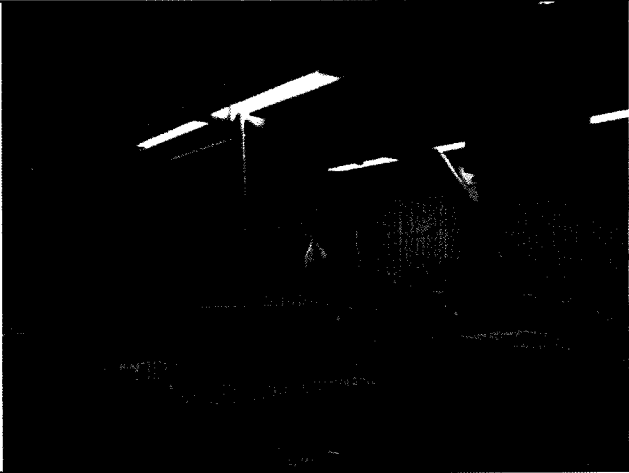
Item # 2E-HS	Description
Component:	Gymnasium light fixtures
Location:	Gymnasium
Deficiency:	Inefficient power consumption, Poor lighting levels, Slow start up
Consequence:	Excess power consumption and poor lighting quality
Photo #2E-HS	
Recommendation:	<p>Replace lighting in gymnasium with 4' T5HO high bay luminaires. These luminaires provide instant start, improved performance and lighting quality over the existing luminaires and offer energy savings with a revised lighting design.</p> <p>Lighting incentives are available through Bonneville Power. It is recommended that funding grants/rebates for this project be investigated.</p>
Cost Estimate:	\$17,321
Priority:	Medium

Item # 3E-HS	Description
Component:	Exterior receptacles
Location:	Shops building
Deficiency:	Not weather-proof per NEC 406.8 (A)
Consequence:	Potential electrical hazard
Photo #3E-HS	
Recommendation:	Provide new receptacle weatherproof cover.
Cost Estimate:	\$20
Priority:	High

Item # 4E-HS	Description
Component:	Electrical Panels
Location:	Weight Room
Deficiency:	Outdated equipment
Consequence:	Potential failure of overprotection devices
Photo #4E-HS	
Recommendation:	Replace existing panels with new panel. Connect existing wiring to new breakers in new panel.
Cost Estimate:	\$5,327
Priority:	Medium


Item # 5E-HS	Description
Component:	Fire alarm notification devices
Location:	Gymnasium
Deficiency:	Not enough notification devices to provide sufficient coverage.
Consequence:	Insufficient coverage poses safety hazards when system alarms
Recommendation:	Install two new strobes and two new horn strobes in gymnasium and connect to existing fire alarm system. Verify existing system will accommodate new devices.
Cost Estimate:	\$2,604
Priority:	Medium

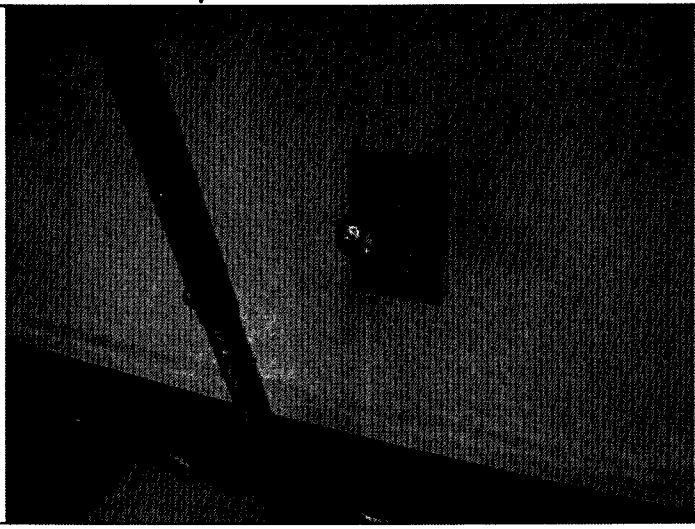
Item # 6E-HS	Description
Component:	Fire alarm notification devices
Location #1:	Boys Restroom
Location #2:	Girls Restroom
Deficiency:	No strobe device in restrooms. Per IBC 907.9.1.1, visible notification devices shall be provided in public and common areas.
Consequence:	Code Violation and insufficient coverage poses safety hazards when system alarms
Recommendation:	Install new strobes in restrooms and connect to existing fire alarm system. Verify existing system will accommodate new devices.
Cost Estimate:	\$1,484
Priority:	Medium

Item # 7E-HS	Description
Component:	Luminaires
Location #1:	Welding Shop
Location #2:	Wood Shop
Deficiency:	Inefficient lamping
Photo 1 #7E-HS:	
Consequence:	Excess power consumption
Recommendation:	Replace lighting with 4' T5HO high bay luminaires. These luminaires offer an improved performance and lighting quality over the existing luminaires and offer energy savings if implemented with a revised lighting design.
Cost Estimate:	\$13,867
Priority:	Low

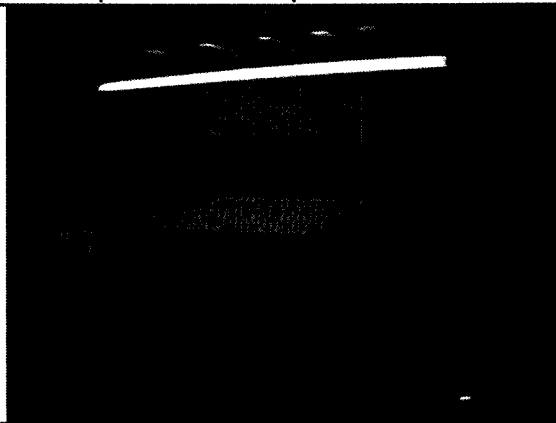
Item # 8E-HS	Description
Component:	Receptacles
Location #1:	Boys and Girls Restroom in Hall
Deficiency:	Receptacle in restroom not GFI
Consequence:	Code violation per 210.8 (B)
Recommendation:	Remove and replace existing receptacles with GFI receptacles.
Cost Estimate:	\$168
Priority:	High

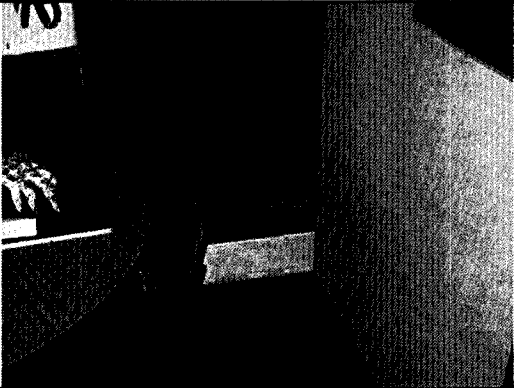

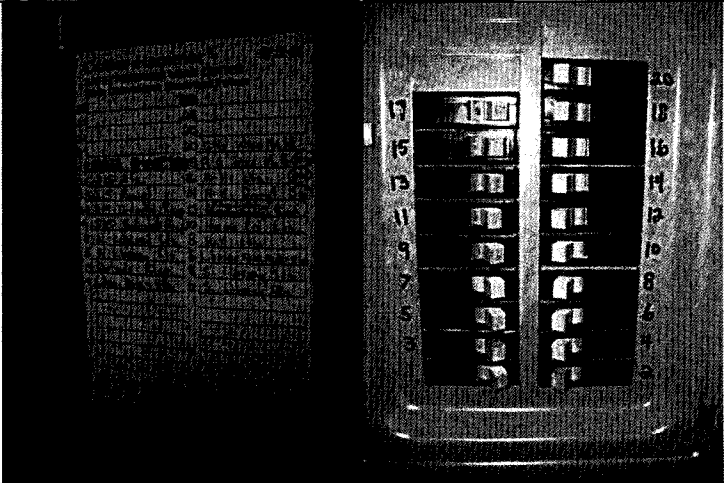
### Junior High School

Item # 1E-JH	Description
Component:	Egress Lighting
Location:	Building Exterior
Deficiency:	Lacking emergency egress lighting
Consequence:	Code violation and life safety hazard in the event of power loss. Per IBC 1006.3, in the event of a power failure, an emergency electrical system shall automatically illuminate exterior landings for exit discharge doorways in buildings that have two or more exits.
Photo 1 #1E-JH	
Recommendations:	Install new exterior luminaire with remote mounted battery or exterior emergency lighting with integral battery rated for cold weather.
Cost Estimate:	\$4,908
Priority:	High

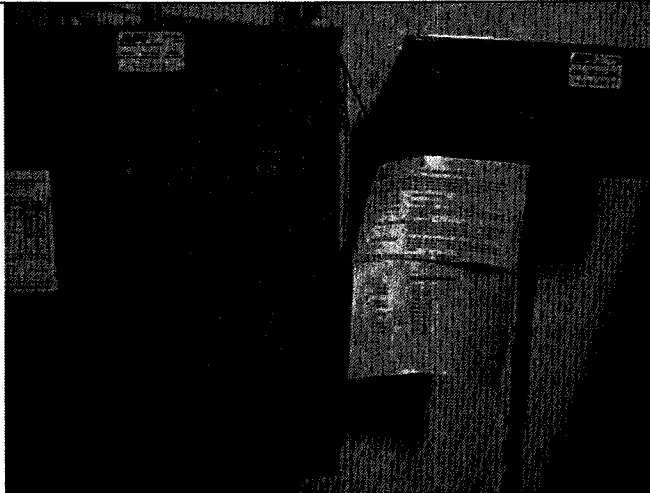
Item # 2E-JH	Description
Component:	Receptacle
Location:	Cafeteria
Deficiency:	Receptacle wired incorrectly, reverse polarity
Consequence:	Potential safety hazard
Photo 1 #2E-JH	
Recommendation:	Rewire the receptacle by reversing the hot and neutral conductors at the receptacle.
Cost Estimate:	\$120
Priority:	High

Item # 3E-JH	Description
Component:	Fire alarm notification devices
Location #1:	Boys and Girls Restroom near kitchen
Location #2:	Boys and Girls Restroom in basement
Location #3:	Insufficient visible notification devices in auditorium
Deficiency:	No strobe device in restrooms. Per IBC 907.9.1.1, visible notification devices shall be provided in public and common areas.
Consequence:	Code Violation and insufficient coverage poses safety hazards when system alarms.
Recommendation:	Install new strobes in restrooms and connect to existing fire alarm system. Verify existing system will accommodate new devices.
Cost Estimate:	\$3,542
Priority:	Medium


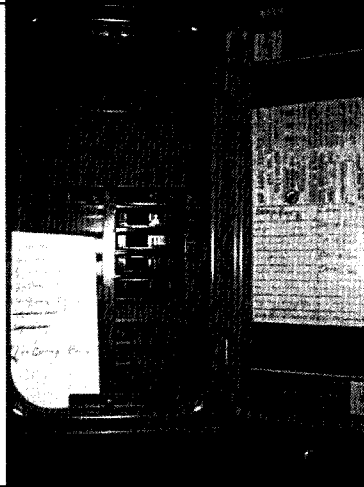
Item # 4E-JH	Description
Component:	Luminaires with T12 lamps
Location #1:	Mechanical Room
Location #2:	Art room
Deficiency:	Inefficient lamping
Consequence:	Excess power consumption
Photo 1 #4E-JH	
Recommendation:	Replace lighting with 4' T5 luminaires. These luminaires offer an improved performance and lighting quality over the existing luminaires and result in energy savings.
Cost Estimate:	\$1,532
Priority:	Low

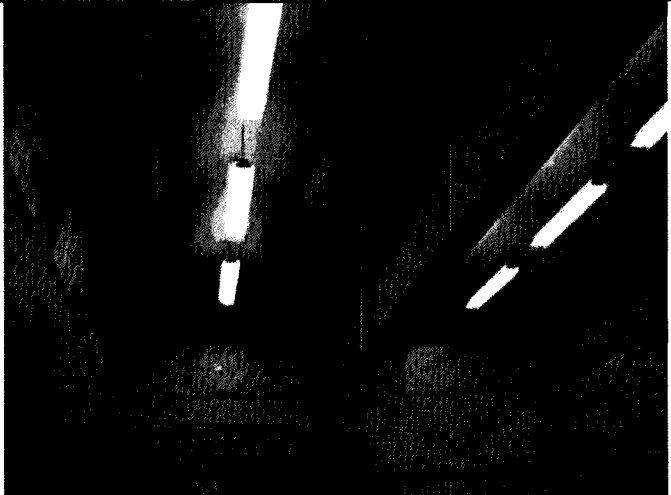

Item # 5E-JH	Description
Component:	Receptacles
Location #1:	Library/Library Storage Areas
Deficiency:	Insufficient quantity of the receptacles
Consequence:	Potential for overloading existing receptacles and circuits. Little room to accommodate electrical needs of future equipment.
Photo 1 #5E-JH	
Photo 2 #5E-JH	
Photo 3-4 #5E-JH	
Recommendation:	Locate and provide new receptacles in library to meet the needs of the space. Provide new electrical cable from new receptacle circuits to new 20A breakers in existing hallway panel.
Cost Estimate:	\$7,099
Priority:	Medium


Item # 6E-JH	Description
Component:	Clocks
Location #1:	Whole Building
Deficiency:	Majority of the clocks are battery operated and not tied to central clock system.
Consequence:	Clocks are not synchronized. Inconvenient for staff.
Recommendation:	Provide new hardwired clocks and tie into existing clock controller or provide new controller with wireless transmitter and new battery operated clocks with wireless receiver. The latter would require an investigation to test signal strength to make sure all clocks would receive the wireless signal from the master control.
Cost Estimate:	\$10,500-\$14,700
Priority:	Low

Item # 7E-JH	Description
Component:	Fire Alarm System
Location #1:	Building (Junior High and High school)
Deficiency:	Building is not up to code with notification device coverage. Fire alarm control panel approaching the end its useful life.
Consequence:	Life safety hazard, code violation. Current code states that the visible notification devices shall be located in all common or public areas; this includes restrooms, corridors, gymnasiums, auditoriums and classrooms. This panel has been discontinued; however aftermarket parts are still available.
Photo #7E-JH	
Recommendations:	Install new strobes and horn/strobes to be located in the common areas in appropriate locations to meet code required coverage. It is possible to connect new devices to this existing panel. It is recommended, however that the alarm system be replaced with a new addressable alarm system. This new system would accommodate both the high school and junior high.
Cost Estimate:	\$35,000-\$56,000
Priority:	High

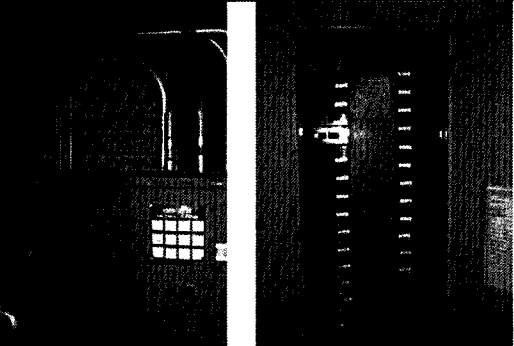
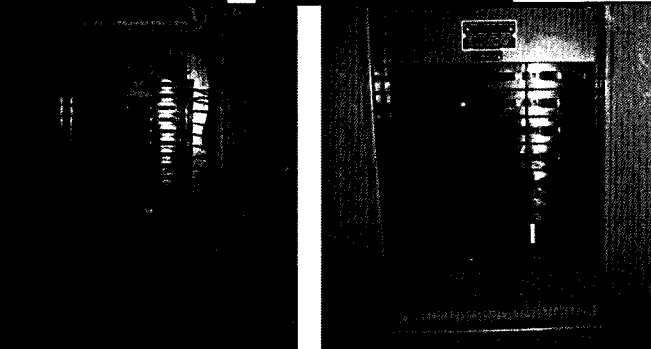
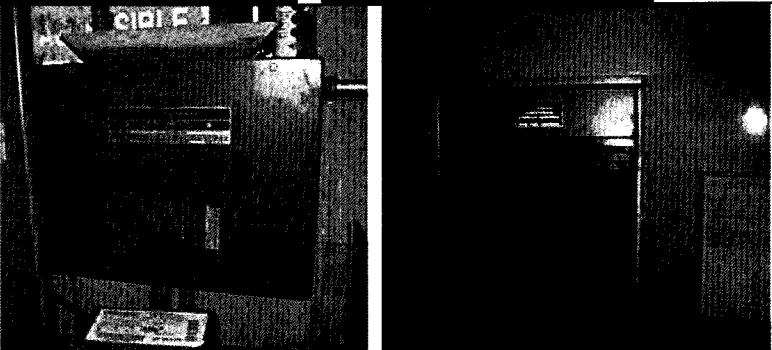
## Elementary School


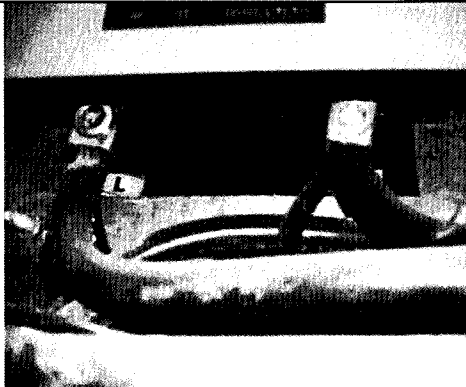
Item # 1E-EL	Description
Component:	Electrical receptacle circuiting
Location:	Multiple classrooms and library
Deficiency:	Insufficient quantity and spacing of electrical receptacles. Most classrooms have no receptacles on their exterior walls. In addition multiple classrooms are currently wired on the same receptacle circuit.
Consequence:	Insufficient power for classroom computers/electronics. There have been multiple problems associated with breakers tripping as a result of this deficiency.
Photo 1 #1E-EL	
Photo 2 #1E-EL	
Recommendation:	Install new convenience receptacles in the classrooms in compliance with NEC codes. This would include receptacles on the exterior walls where there are none. Coordinate the location of additional receptacles to meet the functional needs required by each space. Circuit new receptacles to new 20A/1P breakers in existing load centers (Photo 2). Currently a number of the classrooms share electrical circuits. It is recommended that classrooms receptacles be individually circuited to the electrical panels.
Cost Estimate:	\$21,399
Priority:	Medium

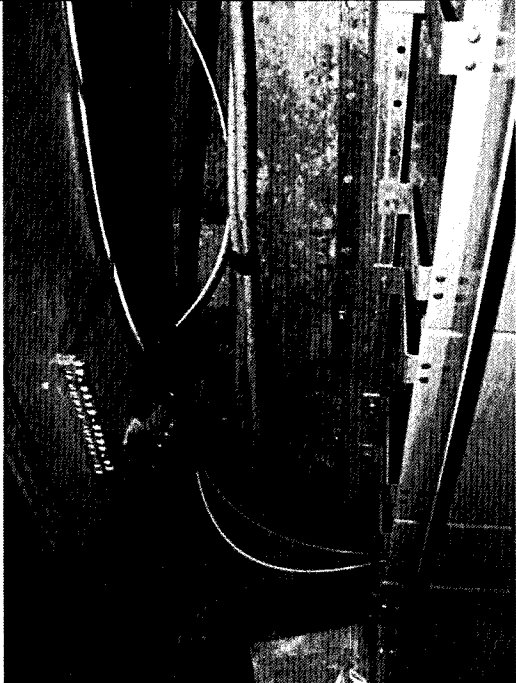
Item # 2E-EL	Description
Component:	(58) 8-ft long, 2-lamp T12 light fixtures (116 lamps total)
Location #1:	Gymnasium (25 luminaires)
Locations #2:	6 Classrooms in addition. (25 luminaires)
Location #3:	Basement (8 luminaires)
Deficiency:	Antiquated and inefficient lighting fixtures/lamps
Consequence:	Inefficient lighting, excess electrical energy costs
Photo #2E-EL	
Photo #2E-EL	
Recommendation:	<p>Replace lighting in gymnasium with 4' T5HO high bay luminaires. These luminaires offer an improved performance and lighting quality over the existing luminaires and result in energy savings if implemented with a revised lighting design. Replace pendant mount luminaires with new high performance luminaires with T5 or T5HO lamping. Replace T12 luminaires in the basement with T5 strip style luminaires.</p> <p>Lighting incentives are available through Bonneville Power. It is recommended that funding grants/rebates for this project be investigated.</p>
Cost Estimate:	\$26,319
Priority:	Low

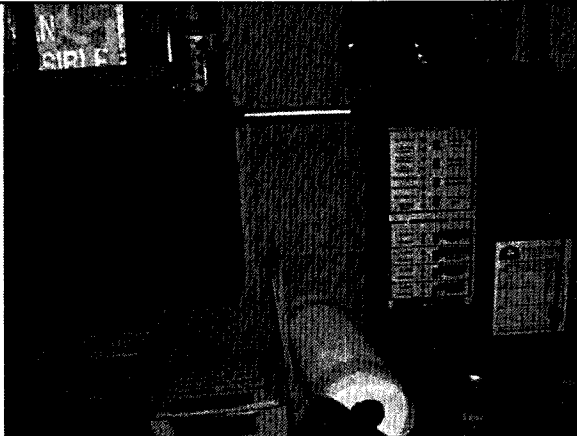
Item # 3E-EL	Description
Component:	Fire Doors
Location #1:	Double doors near 6 classroom addition
Deficiency:	Owner reported the fire doors do not operate properly
Consequence:	Life safety hazard.
Photo #3E-E1	
Recommendations:	Install new magnetic door holds. This project will require coordination with an electrical contractor and fire alarm contractor.
Cost Estimate:	\$2,800
Priority:	High

Item # 4E-EL	Description
Component:	Egress Lighting
Location:	Building Exterior
Deficiency:	Lacking emergency egress lighting
Consequence:	Code violation and life safety hazard in the event of power loss. Per IBC 1006.3, in the event of a power failure, an emergency electrical system shall automatically illuminate exterior landings for exit discharge doorways in buildings that to have two or more exits.
Recommendations:	Install new exterior luminaire with remote mounted battery or exterior emergency lighting with integral battery rated for cold weather.
Cost Estimate:	\$6,168
Priority:	High

Item # 5E-EL	Description
Component:	Panels
Location:	Corridor and Boiler Room
Deficiency:	Outdated equipment.
Consequence:	Potential failure of overprotection devices
Photo 1 & 2 #5E-EL	
Photo 3 & 4 #5E-EL	
Photo 5 & 6 #5E-EL	
Recommendations:	<p>All of the over current protection devices in the existing electric panel boards have reached the end or their rated life. The result can be slower reaction times to meet intended breaker trip settings. These longer reaction times result in more energy being delivered at the location of a fault that needs to be cleared quickly.</p> <p>It is recommended to replace existing panel boards and main distribution panel N with new panel boards that incorporate new circuit breakers with reliable trip settings. Reconnect existing wiring to new breakers in the new panels</p>
Cost Estimate:	\$41,475
Priority:	High

Item # 6E-EL	Description
Component:	Panels A and C
Location #1:	Corridor
Deficiency:	Multiple feeds per lug
Consequence:	Code violation
Photo 1 #6E-EL	 <p>Shared lug for surge protection device</p>
Photo 2 #6E-EL	 <p>Shared lug with sub-feed for computer panel.</p>
Recommendations	<p>Panel A -Relocate surge protection device conductors to spare breakers nearest panel feeder lugs.</p> <p>Panel C – Provide double lug connection to existing main lugs to accommodate separate conductors for new wing feeder.</p>
Cost Estimate:	\$780
Priority:	High

Item # 7E-EL	Description
Component:	Splices and wiring
Location #1:	Main Distribution
Deficiency:	Splice in main distribution panels are not allowed by code. Some (white wiring shown picture #7E-EL) wiring in panel is outdated and should be replaced.
Consequence:	Per NEC 312.8, enclosures for over current protection devices shall not be used as a junction box. The white wiring is outdated, and is potential hazard.
Photo #7E-EL	
Recommendations:	Provide code approved junction box outside of the main distribution panel. All splices shall be within the new junction box(s) outside of the main distribution panel. Pull outdated wiring from existing termination point and replace with new wiring per code.
Cost Estimate:	\$1,144
Priority	High

Item # 8E-EL	Description
Component:	Fire Alarm System
Location #1:	Building
Deficiency:	Building is not up to code with notification device coverage. Fire alarm control panel is beyond its useful life.
Consequence:	Life safety hazard, code violation. Current code states that the visible notification devices shall be located in all common or public areas, which includes restrooms, corridors and classrooms. The current fire alarm control panel is outdated and parts are no longer available. This panel is unable to accommodate any additional visible notification appliances.
Photo #8E-E1	
Recommendations:	It is recommended that the alarm system be replaced with a new addressable alarm system. Install new strobes and horn/strobes to be located in the common areas in appropriate locations to meet code required coverage.
Cost Estimate:	\$35,000-\$56,000
Priority:	Low

Item # 9E-EL	Description
Component:	Clocks
Location #1:	Whole Building
Deficiency:	Majority of the clocks are battery operated and not tied to central clock system.
Consequence:	Clocks are not synchronized. Inconvenient for staff.
Recommendation:	Provide new hardwired clocks and tie into existing clock controller or provide new controller with wireless transmitter and new battery operated clocks with wireless receiver. The latter would require an investigation to test signal strength to make sure all clocks would receive the wireless signal from the master control.
Cost Estimate:	\$8,400-\$11,760
Priority:	Low

## **APPENDIX**

### **SECTION A**

#### **A.1 EXECUTIVE SUMMARY SYSTEM DEFICIENCIES TABLE**

1. General Building Systems Deficiencies
2. Mechanical Systems Deficiencies
3. Electrical Systems Deficiencies

#### **A.2 ROOF INVESTIGATION PLANS**

1. R-1 W.F. Morrison Elementary School
2. R-2 Troy JR. High/High School/Shop Building

### **SECTION B**

#### **B.1 CONSTRUCTION COST ESTIMATES**

MEANS Construction Cost Data was used as the source of the cost data. Construction costs were indexed for the State of Montana using union pay scales. The figures listed include contingencies and contractor overhead and profit.

## **SECTION A**

### **A.1 EXECUTIVE SUMMARY SYSTEM DEFICIENCIES TABLE**

## General Building Systems Deficiencies

Item #	School Type	Deficiency	Location	Description	Estimated Cost	Priority
Item # 1G-HS	High School	Supporting floor structure	Gymnasium	Support structure on cast in place concrete pier foundation.	\$15,069	Low
Item # 2G-HS	High School	Exposed bare soil in crawlspace	Gymnasium	Install a barrier.	\$3,920	High
Item # 3G-HS	High School	Building roof system		Refer to Roof Inv'd in Roof Investigation Survey prepared by Benchmark Roof & Pavement Consult. Refer to Report and Appendix roof plan R-2	--	Medium
Item # 4G-HS	High School	Student lockers	Corridor, original		\$7,959	Low
Item # 5G-HS	High School	4 Stainless steel urinals	Boy's restroom	Install stainless steel urinals with new low flow (1 gpf) automatic flush valve	\$3,809	High
Item # 6G-HS	High School	Multi-user style lavatory basin(s)	Boy's restroom	Install basin with modern style sensor operated fixture. Install hot water heater.	\$18,896	Medium
Item # 7G-HS	High School	Shops building restroom doors	Shops building	Replace with new doors with ADA compliant latches.	\$1,027	Low
Item # 8G-HS	High School	Roof drain/roof penetration		365 sq-ft roof sealoff penetration. Repair and reseal roof as Required.	--	Medium
Item # 9G-HS	High School	Gypsum board ceilings	Central corridor	Repairs.	\$4,654	Low
Item # 1G-JH	Junior High School	Building roof system		Refer to Roof Inv'd in Roof Investigation Survey prepared by Benchmark Roof & Pavement Consult. Refer to Report and Appendix roof plan R-2	--	Medium
Item # 2G-JH	Junior High School	Handicap accessible and general restrooms	Junior high base to the auditorium	Handicap accessible location at Junior high school main level. New access fixtures and hardware. As identified in Montana Department of Commerce Quality Schools project grant application.	\$1,175,270	High
Item # 3G-JH	Junior High School	Platform, stair climber wheelchair lift	Central three-story	Identify location for the new elevator. As identified in Quality Schools project grant application.	\$1,175,270	High
Item # 4G-JH	Junior High School	Handicap Access to Entire Facility (Interior Corridor Staircase)	Main level corridor	Identify location for the new elevator. As identified in Quality Schools project grant application.	\$1,175,270	Medium
Item # 5G-JH	Junior High School	Single point entry	Main entrances	Convert parking lot facility to serve as a single point entry. Access spaces will be required to localize the flow of traffic through the main Department of Commerce Quality Schools project grant	\$1,175,270	Low
Item # 6G-JH	Junior High School	Exterior concrete entry staircases	Front entry (east) ramp/stair (north)	Install stair with continuous guard rail.	\$16,244	Medium
Item # 7G-JH	Junior High School	Exterior entry staircase	Front entry (east)	Stairs to extend beyond last tread of staircase.	\$4,284	Medium
Item # 8G-JH	Junior High School	Exterior entry doors	Front entry (east), Handicap entry	Install modern energy efficient doors with weather stripping, and ADA	\$22,360	High
Item # 9G-JH	Junior High School	Furred window openings	Multiple window	Replace windows with a combination of thermally efficient double pane Kal-Wall system.	\$125,151	Low
Item # 10G-JH	Junior High School	Third floor fire escape	Northwest corner	Repair of existing emergency staircase to building structure.	\$910	High

Item # 11G-JH	Junior High School	Single pane windows at building entryways	Front Entry (East) windows with custom thermally efficient double pan glass.	\$8,723	Low
Item # 11G-EL	Elementary School	Building roof system	Refer to Roof Investigation Survey prepared by Benchmark Roof & Pavement Consulting, Inc. Refer to Report and Appendix roof plan R-1.	--	Medium
Item # 2G-EL	Elementary School	Structural settlement of roof system	Roof over boiler room structure above boiler room and reconstruct new engineered roof structure, membrane, and fire rated ceiling.	\$31,869	High
Item # 3G-EL	Elementary School	Skylights	Central corridor skylight poor efficiency dome skylights with modern thermally efficient skylights.	\$13,605	Medium
Item # 4G-EL	Elementary School	Tile floor transition	Corridor at south end of building floor system, grind and/or level concrete expansion joint, and to match.	\$2,500	Low (Medium)
Item # 5G-EL	Elementary School	New operable classroom window sections	Classrooms original foam weather sealing to existing air gaps at recently replaced classroom addition and caulk, paint to match.	--	High
<b>Mechanical Systems Deficiencies</b>					
Item # 1M-HS	High School	Steam condensate pump and associated piping fittings	The southeast corner of the building. Condensate lines with new insulated piping. Replace existing steam condensate pump located at crawl space entrance to gymnasium. Replace the steam turbine and steam heating devices throughout system. Strongly recommend replacing the steam system with a high efficiency hot water boiler and associated piping.	\$33,300	High
Item # 2M-HS	High School	Finned-tube steam radiator	Gymnasium (Southwest corner). Replace existing radiators and associated piping. Provide new ducted air handler unit for gymnasium. The new air handler would include a hot water coil, for ventilation air connections.	\$42,086	Medium
Item # 3M-HS	High School	High School steam heating plant	Mechanical room. Replace boiler burners and fuel oil distribution system. It is recommended that the steam system be entirely converted over to hot water. Refer to Item # 1M-HS for fuel oil tank and replace with new underground propane tank in crawl space.	\$30,185	Low
Item # 4M-HS	High School	High School steam heating boiler and devices	Original portion of gymnasium, boys' locker room unit ventilators, and boys and girls locker room unit. Replace plant with a new high efficiency propane fired condensing gas hot water boiler. It would be replacing all steam heating devices which include: room unit ventilators, and boys and girls locker room unit.	\$239,346	Medium
Item # 5M-HS	High School	Central air-handler; fan belt, sheaves and bearings	Shops building at rear of building. Rebalance existing air handling unit. Rebalance existing air system.	\$1,417	High
Item # 6M-HS	High School	Central heating system's pneumatic controls	Entire facility, classroom. Replace with modern direct digital controls.	\$81,027	Low
Item # 1M-JH	Junior High School	Junior High School steam heating plant	Mechanical room. Replace boiler burners and fuel oil distribution system. It is recommended that the steam system be entirely converted over to hot water. Refer to Item # 1M-HS for fuel oil tank and replace with new underground propane tank in crawl space.	\$29,144	Low
Item # 2M-JH	Junior High School	Junior High School steam heating unit ventilators, radiators, piping and devices	Classrooms and shops building. Replace plant with a new high efficiency propane fired condensing gas hot water boiler. It would be replacing all steam heating devices; classroom unit ventilators and shops building unit ventilators and associated piping.	\$386,283	Low
Item # 3M-JH	Junior High School	Central heating system's pneumatic controls	Entire facility, classroom. Replace with modern direct digital controls.	\$88,479	Low
Item # 4M-JH	Junior High School	Ventilation air systems	Auditorium. Replace existing air handler with new ducted air distribution system. New air handler will include hot water coil, modern comfort controls, demand controlled ventilation, and new air handler could possibly be located in structural space above auditorium.	\$33,949	Low
Item # 5M-HS	High School	4 Original 1950's era, steam-unit ventilators	4 classrooms in shops building. Replace existing unit ventilators with new classroom ventilators. The new units could be located in existing boiler system.	\$32,535	Medium
Item # 1M-EL	Elementary School	Elementary School steam heating piping, steam traps and devices	Thirteen of the school's classrooms. Replace unit ventilators, steam traps and existing unit ventilators and steam tunnels.	\$4,485	Medium

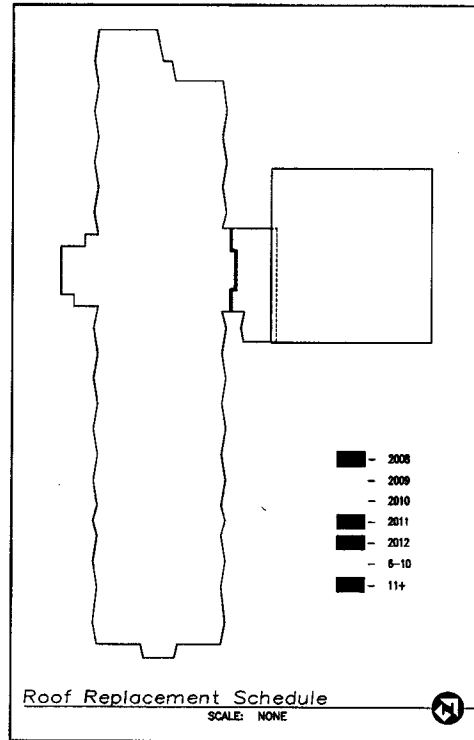
Item # 2M-EL	Elementary School	Air-handling unit, steam heating coil	Gymnasium air-handling unit. Sediment buildup and clean or replace as required. Install cause of moisture leak.	\$2,028	Medium
Item # 3M-EL	Elementary School	Central heating system's pneumatic controls	Entire facility, clean with modern direct digital controls.	\$124,187	Low
Item # 4M-EL	Elementary School	Kitchen freezer refrigerant piping to exterior condenser	Northwest (front to all piping.	\$1,106	High
<b>Electrical Systems Deficiencies</b>					
Item # 1E-HS	High School	Egress Lighting	Building interior required by code. This can be done by utilizing combination exit fitting luminaires in the egress path with battery ballasts. Exterior utilizing a low voltage remote head or installing new wall pack with low voltage lamping and remote battery for emergency use.	\$9,856	High
Item # 2E-HS	High School	Gymnasium light fixtures	Gymnasium 4' TSHO high bay luminaires. These luminaires provide instant start, quality over the existing luminaires and offer energy savings with a	\$17,321	Medium
Item # 3E-HS	High School	Exterior receptacles	Shops building of cover.	\$20	High
Item # 4E-HS	High School	Electrical Panels	Weight Room connect existing wiring to new breakers in new panel.	\$5,327	Medium
Item # 5E-HS	High School	Fire alarm notification devices	Gymnasium connect to existing fire alarm system. Verify existing system will	\$2,604	Medium
Item # 6E-HS	High School	Fire alarm notification devices	Boys Restroom, connect to existing fire alarm system. Verify existing system	\$1,484	Medium
Item # 7E-HS	High School	Luminaires	Welding Shop, Verify luminaires. These luminaires offer an improved performance luminaires and offer energy savings with a revised lighting design	\$13,867	Low
Item # 8E-HS	High School	Receptacles	Boys and Girls Rm with GFI receptacles.	\$168	High
Item # 1E-JH	Junior High School	Exterior egress	Exit doors remote mounted battery or exterior emergency lighting with ver.	\$4,908	High
Item # 2E-JH	Junior High School	Receptacle	Cafeteria the hot and neutral conductors at the receptacle.	\$120	High
Item # 3E-JH	Junior High School	Fire alarm notification devices	Boys and Girls Rm connect to existing fire alarm system. Verify existing system will	\$3,542	Medium
Item # 4E-JH	Junior High School	Luminaires with T12 lamps	Mechanical Room and offer small energy savings. Less lamps types to store when if high/high school complex.	\$1,532	Low
Item # 5E-JH	Junior High School	Receptacles	Library/Library 3 in library to meet the needs of the space. Remove new devices to y panel.	\$7,099	Medium
Item # 6E-JH	Junior High School	Clocks	Whole Building/ie into existing clock controller or provide new controller with y operated clocks with wireless receiver. The latter would require th to make sure all clocks would receive the wireless signal from	\$10,500-\$14,700	Low
Item # 7E-JH	Junior High School	Fire Alarm System	Building s located in the common areas in appropriate locations to meet e to connect new devices this panel, however the best option rem with a new addressable system. This new system would unior high.	\$35,000-\$56,000	High

Item # 1E-EL	Elementary School	Electrical receptacle circuiting	on exterior walls and where required in to meet the needs of the Multiple classroom 20A/1P breakers in existing load centers (Photo 2). Also, classrooms are not sharing circuits with other classrooms.	\$21,399	Medium
Item # 2E-EL	Elementary School	(58) 8-ft. long, 2-lamp T12 light fixtures (116 lamps total)	1' TSHO high bay luminaires. These luminaires offer an improved in the existing luminaires and offer energy savings with a revised Gymnasium, 6' high new high performance luminaires with TS or TSHO lamping. 4' TS strips style luminaires. Minimize an outdated lamp type and offer energy savings.	\$26,319	Low
Item # 3E-EL	Elementary School	Fire Doors	ically, this will require coordination with an electrical contractor to Double doors need and coordination with the fire alarm contractor to connect the	\$2,800	High
Item # 4E-EL	Elementary School	Egress Lighting	Building Interior remote mounted battery or exterior emergency lighting with per.	\$6,168	High
Item # 5E-EL	Elementary School	Panels	Corridor and Boll distribution gear with new. Connect existing wiring to new breakers in	\$41,475	High
Item # 6E-EL	Elementary School	Panels A and C	Corridor device conductors to spare breakers nearest panel feeder lugs. tion to existing main lugs to accommodate separate conductors for	\$780	High
Item # 7E-EL	Elementary School	Splices and wiring	Main Distribution to new conductors from new splice box to MDP. Pull outdated	\$1,144	High
Item # 8E-EL	Elementary School	Fire Alarm System	Building control panel and notification devices as required by code. This /strobes located in the common areas in appropriate locations to	\$35,000-\$56,000	Low
Item # 9E-EL	Elementary School	Clocks	Building e into existing clock controller or provide new controller with y operated clocks with wireless receiver. The latter would require th to make sure all clocks would receive the wireless signal from	\$8,400-\$11,760	Low

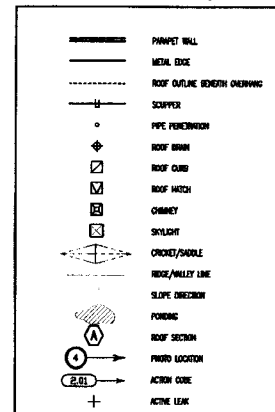
129'

29'

218'



#### SYMBOL LEGEND



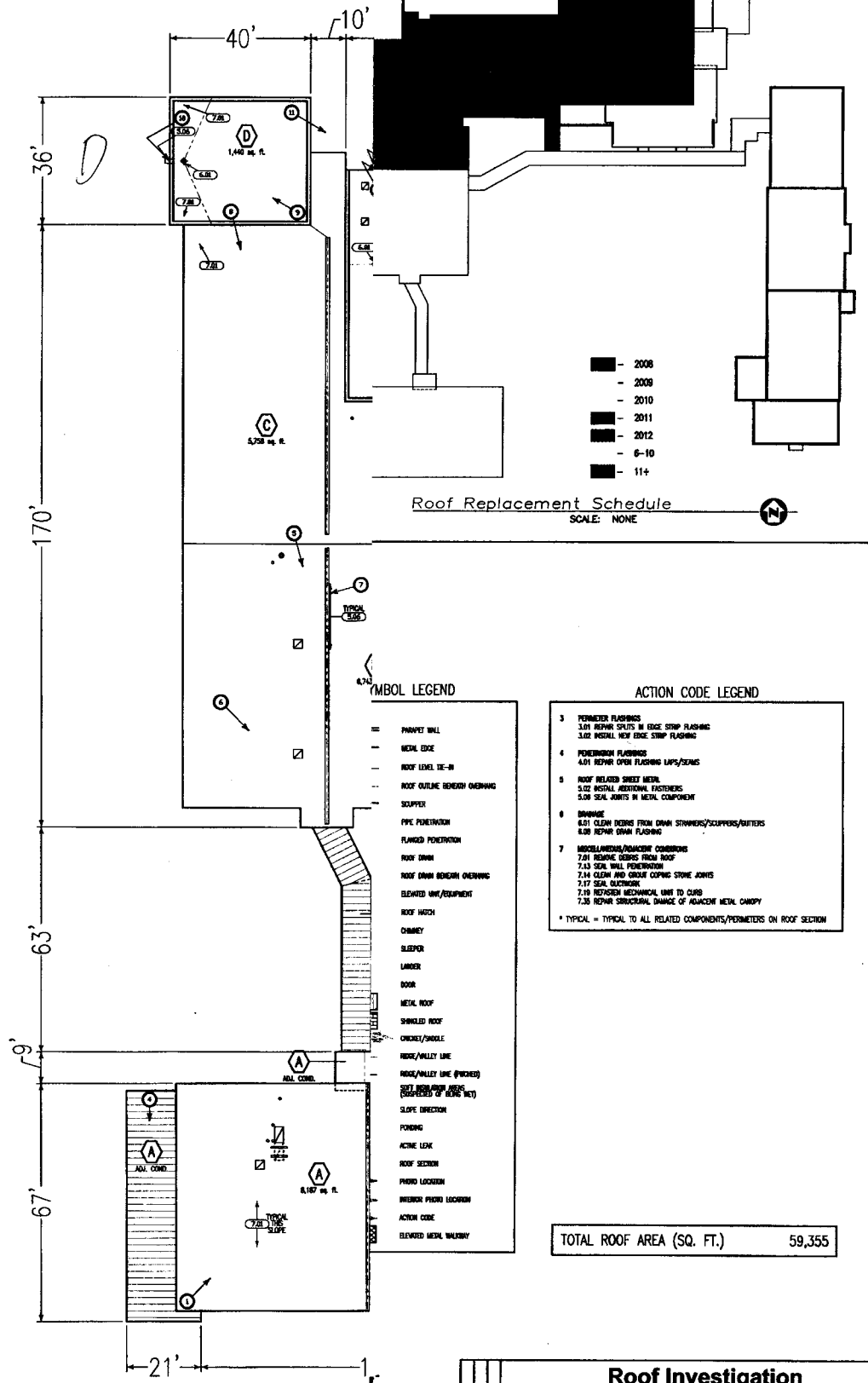
#### ACTION CODE LEGEND

2	FIELD MEMBRANE
2.07	REPAIR PUNCTURED/DAMAGED MEMBRANE
2.13	REPAIR SEAM VOID
4	PERFORATION FLASHINGS
4.01	REPAIR OPEN FLASHING LAPS/SEAMS
6	DRAINAGE
6.01	CLEAN WEIRS FROM GROUND DRAINERS/SCUPPERS/OUTLETS
6.03	INSTALL NEW GROUND DRAINER
7	MISCELLANEOUS/DAMAGED CONDITIONS
7.23	REPLACE DAMAGED SKYLIGHT

TOTAL ROOF AREA (SQ. FT.) 42,574

<b>Roof Investigation</b> <b>TROY SCHOOL DISTRICT</b> W. F. MORRISON ELEMENTARY SCHOOL 501 EAST KALISPELL TROY, MT			
REV. NO. DATE DRAWN BY CHECKED BY	DATE DATE DATE DATE	MANAGER: H. WILSON DRAWN BY: K. JACKSON DATE: 05/11/07 JOB NO.: 0500000004 DRAWING NO.: 001.000	SHEET: <b>R-1</b>

**Benchmark**  
 ROOF & PAVEMENT CONSULTANTS  
 CEDAR RAPIDS, IA | ELM GROVE, WI  
 Phone: 319.383.8100  
 www.benchmark-inc.com



Roof Investigation			
TROY SCHOOL DISTRICT			
TROY JR. HIGH/HIGH SCHOOL/SHOP BUILDING			
105 EAST MISSOULA			
TROY, MT			
<b>Benchmark</b> ROOF & PAVEMENT CONSULTANTS CEDAR RAPIDS, IA   ELM GROVE, WI Phone: 319.383.9100 www.benchmark-ia-inc.com		DRAWN BY: M. WILSON DATE: 08/18/07 JOB NO.: ENT000001A DRAWING NO.: 002.DWG	

## **SECTION B**

### **B.1 CONSTRUCTION COST ESTIMATES**

## Construction Costs: Recommendations

### #1G-HS - High School Gymnasium: Add Floor Structure (Post & Beam)

Qty	Description	Unit	Total Incl. O&P
3	03 30 53 3950 Miscellaneous Cast-In-Place Concrete, Footings, strip (3000 psi) 36"x12", reinforced	C.Y.	645
8	06 18 13 8120 Glued-Laminated Beams, Straight beams, 20' span, 5-1/8"x15"	Ea.	2,920
32	06 11 10 0480 Framing with Dimensional, Engineered or Composite Lumber, Posts and Columns 6"x6"	M.B.F.	592
1	Crawspace Difficulty factor	%	6,236
Totals			\$ 10,393
Design Fee			\$ 1,559
Contingency			\$ 2,079
General Conditions, Insurance, Taxes			\$ 1,039
Total Costs			\$ 15,069

### #2G-HS - High School Gymnasium: Add Ground Cover Moisture Barrier, Crawspace

Qty	Description	Unit	Total Incl. O&P
80	07 26 10 1200 Above-Grade Vapor Retarders, Polyethylene vapor barrier, standard, .010" thick	S.Q.	1,340
1	Crawspace Difficulty factor	%	1,675
Totals			\$ 3,015
Design Fee			\$ -
Contingency			\$ 603
General Conditions, Insurance, Taxes			\$ 302
Total Costs			\$ 3,920

### #3G-HS - High School: Various Minor Roof Repairs

Qty	Description	Unit	Total Incl. O&P
	Refer to Appendix: Roof Investigation Survey Prepared by Benchmark Roof & Pavement Consultants, August 2007		
Totals			\$ -
Design Fee			\$ -
Contingency			\$ -
General Conditions, Insurance, Taxes			\$ -
Total Costs			\$ -

### #4G-HS - High School: Resurface and Recondition Student Locker (Original 1950's Portion of School)

Qty	Description	Unit	Total Incl. O&P
1,400	09 91 23 0400 Interior Painting, Electrostatic Painting, Flat Surfaces (lockers, casework, elev doors, etc), Two coats	S.F.	3,122
1	Misc. Prep. Work, Taping & Tenting	L.S.	3,000
Totals			\$ 6,122
Design Fee			\$ -
Contingency			\$ 1,224
General Conditions, Insurance, Taxes			\$ 612
Total Costs			\$ 7,959

### #5G-HS - High School: Remove and Replace 4 Existing Stainless Steel Urinals With Low Flow Fixtures

Qty	Description	Unit	Total Incl. O&P
4	22 42 13 3100 Commercial: Urinals, Wall hung, vitreous china, with hanger & self-closing valve, Siphon jet type	Ea.	2,180
1	Misc. Plumbing Modifications	L.S.	750
Totals			\$ 2,930
Design Fee			\$ -
Contingency			\$ 586
General Conditions, Insurance, Taxes			\$ 293
Total Costs			\$ 3,809

### #6G-HS - High School: Remove and Replace 2 Existing Multi-User Style Lavatory Basins, Add Point of Use Water Heater

Qty	Description	Unit	Total Incl. O&P
2	22 42 33 5620 Commercial Wash Fountains, Group, infrared control, barrier free, Precast terrazzo, Semi-circular 36" diam., 3	Ea.	12,750
1	22 33 13 8974 Instantaneous Electric Point-of-Use Water Heater, electric, glass lined, 6 gal. single element	Ea.	535
1	Misc. Plumbing Modifications	L.S.	750
1	Misc. Electrical Connections	Ea.	500
Totals			\$ 14,535
Design Fee			\$ -
Contingency			\$ 2,907
General Conditions, Insurance, Taxes			\$ 1,454
Total Costs			\$ 18,896

### #7G-HS - High School Shop: Replace Restroom Doors, Jams and Frames, ADA Compliant Hardware

Qty	Description	Unit	Total Incl. O&P
2	08 13 13 0060 Hollow Metal Doors, 1-3/8" thick, 20 ga., 3'-0" x 6'-8"	Ea.	790
Totals			\$ 790
Design Fee			\$ -
Contingency			\$ 158
General Conditions, Insurance, Taxes			\$ 79
Total Costs			\$ 1,027

## Construction Costs: Recommendations

### #8G-HS - High School Weight Room: Repair/Monitor Roof Leak at Roof Drain Penetration

Qty	Description	Unit	Total Incl. O&P
	Refer to Appendix: Roof Investigation Survey Prepared by Benchmark Roof & Pavement Consultants, August 2007		
	Totals	\$	-
	Design Fee	\$	-
	Contingency	\$	-
	General Conditions, Insurance, Taxes	\$	-
	<b>Total Costs</b>	\$	-

### #9G-HS - High School: Tape, Texture and Paint Cracking/Separating Joints

Qty	Description	Unit	Total Incl. O&P
400	09 29 10 1090 Gypsum Board Panels, On ceilings, standard, With compound skim coat (level 5 finish)	S.F.	500
400	09 91 03 0680 Paint Restoration, Interior Surface Preparation, Gypsum board or plaster, heavy	S.F.	80
1	Misc. Prep. Work, Taping & Tinting	L.S.	3,000
	Totals	\$	3,580
	Design Fee	\$	-
	Contingency	\$	716
	General Conditions, Insurance, Taxes	\$	358
	<b>Total Costs</b>	\$	4,654

### #1G-JH - Junior High: Various Minor Roof Repairs

Qty	Description	Unit	Total Incl. O&P
	Refer to Appendix: Roof Investigation Survey Prepared by Benchmark Roof & Pavement Consultants, August 2007		
	Totals	\$	-
	Design Fee	\$	-
	Contingency	\$	-
	General Conditions, Insurance, Taxes	\$	-
	<b>Total Costs</b>	\$	-

### #2G-JH - Junior High: Major Building Modification/Addition Project, Handicap Accessible Restrooms, New Admin. Area, New Entry, Elevator

Qty	Description	Unit	Total Incl. O&P
	Refer to Quality Schools Project Grant Application Prepared by Architects Design Group, February 2010		1,175,270
	Totals	\$	1,175,270
	Design Fee	\$	-
	Contingency	\$	-
	General Conditions, Insurance, Taxes	\$	-
	<b>Total Costs</b>	\$	1,175,270

### #3G-JH - Junior High: Major Building Modification/Addition Project, Handicap Accessible Restrooms, New Admin. Area, New Entry, Elevator

Qty	Description	Unit	Total Incl. O&P
	Refer to Quality Schools Project Grant Application Prepared by Architects Design Group, February 2010		1,175,270
	Totals	\$	1,175,270
	Design Fee	\$	-
	Contingency	\$	-
	General Conditions, Insurance, Taxes	\$	-
	<b>Total Costs</b>	\$	1,175,270

### #4G-JH - Junior High: Major Building Modification/Addition Project, Handicap Accessible Restrooms, New Admin. Area, New Entry, Elevator

Qty	Description	Unit	Total Incl. O&P
	Refer to Quality Schools Project Grant Application Prepared by Architects Design Group, February 2010		1,175,270
	Totals	\$	1,175,270
	Design Fee	\$	-
	Contingency	\$	-
	General Conditions, Insurance, Taxes	\$	-
	<b>Total Costs</b>	\$	1,175,270

### #5G-JH - Junior High: Major Building Modification/Addition Project, Handicap Accessible Restrooms, New Admin. Area, New Entry, Elevator

Qty	Description	Unit	Total Incl. O&P
	Refer to Quality Schools Project Grant Application Prepared by Architects Design Group, February 2010		1,175,270
	Totals	\$	1,175,270
	Design Fee	\$	-
	Contingency	\$	-
	General Conditions, Insurance, Taxes	\$	-
	<b>Total Costs</b>	\$	1,175,270

### #6G-JH - Junior High: Construct New Cast-In-Place Concrete Stair with Continuous Guard Rail, Front Entry (East), Auditorium (East)

Qty	Description	Unit	Total Incl. O&P
1	Demolition, Existing Concrete Stairs & Railing	L.S.	2,500
2	C2010 110 Stairs, C.I.P. concrete, w/landing, 12 risers, With nosing	Flight	7,200
45	05 52 13 0580 Railings, Pipe, shop fab'd, 3'-6" high, posts @ 5' O.C.	L.F.	2,295
1	Misc. Painting, Finish	L.S.	500
	Totals	\$	12,495
	Design Fee	\$	-
	Contingency	\$	2,499
	General Conditions, Insurance, Taxes	\$	1,250
	<b>Total Costs</b>	\$	16,244

## Construction Costs: Recommendations

### #7G-JH - Junior High: Construct New Continuous Guard Rail, Front Entry (East), Auditorium (East)

Qty	Description	Unit	Total Incl. O&P
1	Demolition, Existing Stair Railing	L.S.	500
45	05 52 13 0580 Railings, Pipe, shop fab'd, 3'-6" high, posts @ 5' O.C.	L.F.	2,295
1	Misc. Painting, Finish	L.S.	500
Totals			\$ 3,295
Design Fee			\$ -
Contingency			\$ 659
General Conditions, Insurance, Taxes			\$ 330
Total Costs			\$ 4,284

### #8G-JH - High School: Replace Existing Exterior Doors/Frames, Front Entry (East), Auditorium (East & West), Handicap Entry (North)

Qty	Description	Unit	Total Incl. O&P
4	Demolition, Existing Double Door/Frame Assemblies	L.S.	1,000
4	B2030 110 6350 Glazed Doors, Steel or Aluminum, Alum. & glass, w/panic Hrdwre., dbl door 6'-0"x7'-0"	Ea.	15,400
4	Misc. Painting & Trim Work	L.S.	800
Totals			\$ 17,200
Design Fee			\$ -
Contingency			\$ 3,440
General Conditions, Insurance, Taxes			\$ 1,720
Total Costs			\$ 22,360

### #9G-JH - Junior High: Remove & Replace Existing Window Systems, Entire Facility, High-Eff. Glass & Translucent Kal-Wall System

Qty	Description	Unit	Total Incl. O&P
<b>Demolition</b>			
14	08 05 05 1020 Selective Demolition of Windows, Steel, including trim, to 25 S.F.	Ea.	406
23	08 05 05 1040 Selective Demolition of Windows, Steel, including trim, to 50 S.F.	Ea.	1,392
<b>New Construction</b>			
<u>North Windows</u>			
68	08 45 Translucent Wall and Roof Assemblies, 1550 Grid type, 4' to 10' modules, single glass glazed, maximum	S.F.	4,794
136	B2020 210 1750 Tubular Aluminum Framing, insulated glass, 2"x4-1/2", 5x6' opening, one intermediate horizontal	S.F.	3,924
<u>East Windows (Front)</u>			
268	08 45 Translucent Wall and Roof Assemblies, 1550 Grid type, 4' to 10' modules, single glass glazed, maximum	S.F.	18,753
709	B2020 210 1750 Tubular Aluminum Framing, insulated glass, 2"x4-1/2", 5x6' opening, one intermediate horizontal	S.F.	20,455
<u>South Windows</u>			
28	08 45 Translucent Wall and Roof Assemblies, 1550 Grid type, 4' to 10' modules, single glass glazed, maximum	S.F.	1,974
80	B2020 210 1750 Tubular Aluminum Framing, insulated glass, 2"x4-1/2", 5x6' opening, one intermediate horizontal	S.F.	2,308
<u>West Windows</u>			
252	08 45 Translucent Wall and Roof Assemblies, 1550 Grid type, 4' to 10' modules, single glass glazed, maximum	S.F.	17,766
504	B2020 210 1750 Tubular Aluminum Framing, insulated glass, 2"x4-1/2", 5x6' opening, one intermediate horizontal	S.F.	14,540
Totals			\$ 86,311
Design Fee			\$ 12,947
Contingency			\$ 17,262
General Conditions, Insurance, Taxes			\$ 8,631
Total Costs			\$ 125,151

### #10G-JH - Junior High: Third Floor Fire Escape, Evaluate and Identify Proper Securing of Existing Staircase to Building Structure

Qty	Description	Unit	Total Incl. O&P
1	Structural Engineer's Investigation & Evaluation	L.S.	700
Totals			\$ 700
Design Fee			\$ -
Contingency			\$ 140
General Conditions, Insurance, Taxes			\$ 70
Total Costs			\$ 910

### #11G-JH - Junior High: 2 Front (East) Entrances, Remove and Replace Single Pane Windows W/ Custom, Therm. Eff. 2-Pane Glass

Qty	Description	Unit	Total Incl. O&P
<b>Demolition</b>			
5	08 05 05 1020 Selective Demolition of Windows, Steel, including trim, to 25 S.F.	Ea.	145
2	08 05 05 1040 Selective Demolition of Windows, Steel, including trim, to 50 S.F.	Ea.	121
<b>New Construction</b>			
<u>Front Entry Windows (East)</u>			
1	08 52 16 1380 Bow Window Including frames, screens, and grilles, Vinyl clad, double insulated glass 10'-0"x 6'-0", 5 panels	Ea.	2,450
5	08 52 10 0524 Casement Window, vinyl clad, premium, double insulated glass, 2'-0"x 4'-0"	Ea.	1,775
<u>Auditorium Entry Windows (East)</u>			
1	08 52 16 1340 Bow Window Including frames, screens, and grilles, Vinyl clad, double insulated glass 9'-0"x 4'-0", 4 panels	Ea.	1,525
Totals			\$ 6,016
Design Fee			\$ 902
Contingency			\$ 1,203
General Conditions, Insurance, Taxes			\$ 602
Total Costs			\$ 8,723

## Construction Costs: Recommendations

### #1G-EL - Elementary School: Various Minor Roof Repairs

Qty	Description	Unit	Total Incl. O&P
	Refer to Appendix: Roof Investigation Survey Prepared by Benchmark Roof & Pavement Consultants, August 2007		

### #2G-EL - Elementary School: Boiler Room Roof Settlement, Construct New Supporting Roof Structure, Sloped Roof Insulation & Drainage

Qty	Description	Unit	Total Incl. O&P
	<b>Demolition</b>		
526	Roof Demolition & Disposal: Gypsum Board Plaster Cell., 2x12 Joists at 16" O.C., Sheathing to 1" thick, Roof Insulation, Mem	5 S.F.	5,786
1	Disconnect, Support & Reconnect Ceiling Suspended Mech., Elect., Plumb	L.S.	7,500
	<b>New Construction</b>		
526	C3030 110 5100 Drywall Ceilings, 5/8" F.R. drywall, painted and textured, 1"x3" wood, 16" O.C., wood	S.F.	1,268
526	B1020 102 Wood/Flat or Pitched 7001 Wood truss, 4 in 12 slope, 24" O.C., 24' to 29' span	S.F.	2,772
526	B3010 320 2650 Roof Deck Rigid Insulation, 40 PSI compressive strength, 3" thick R15	S.F.	968
526	B3010 320 2650 Roof Deck Rigid Insulation, 40 PSI compressive strength, 3" thick R15	S.F.	968
526	B3010 120 2000 Single Ply Membrane, EPDM (Ethylene propylene diene monomer), 45 mils, fully adhered	S.F.	889
70	B3010 420 2800 Roof Edges, Sheet Metal, galvanized, 20 Ga., 6" Face Height	L.F.	1,295
2	D2040 210 Roof Drain Systems, Roof drain, DWV PVC, 3" diam., piping 10' high	Ea.	1,318
Totals			\$ 22,763
Design Fee			\$ 2,276
Contingency			\$ 4,553
General Conditions, Insurance, Taxes			\$ 2,276
Total Costs			\$ 31,869

### #3G-EL - Elementary School: Skylights, Remove/Replace (16) Exist., Poor-Eff. Dome Skylights W/ Modern, Therm. Eff. Translucent Skylights

Qty	Description	Unit	Total Incl. O&P
	<b>Demolition</b>		
256	08 05 05 Selective Demolition of Skylight, 4410 pldc domes, flush/curt mtd	S.F.	630
	<b>New Construction</b>		
256	08 45 0020 Translucent Wall and Roof Assemblies: Skyroofs, Translucent panels, 2-3/4" thick Under 5000 S.F.	S.F.	9,088
Totals			\$ 9,718
Design Fee			\$ 972
Contingency			\$ 1,944
General Conditions, Insurance, Taxes			\$ 972
Total Costs			\$ 13,605

### #4G-EL - Elementary School: Tile Floor Transition, Reconstruct Floor Transition, New Tile Flooring to Match

Qty	Description	Unit	Total Incl. O&P
1	Demo. Portion of existing tile floor system, grind and/or level concrete expansion joint, reconstruct new tile floor to match exist	L.S.	2,500
Totals			\$ 2,500
Design Fee			\$ -
Contingency			\$ -
General Conditions, Insurance, Taxes			\$ -
Total Costs			\$ 2,500

### #5G-EL - Elementary School: Recently Replaced Operable Window Sections, Weather Strip and/or Spray Foam Seams/Air-Gaps

Qty	Description	Unit	Total Incl. O&P
	Project to be completed by installation contractor as part of original scope of work		0

### #1M-HS - High School: Repair Steam/Condensate Leaks Associated With Steam Heating Devices in Crawlspace Below Gymnasium

Qty	Description	Unit	Total Incl. O&P
	<b>Demolition</b>		
1	Remove Existing Condensate Pumps, Piping, Valves	L.S.	2,400
	<b>New Construction</b>		
2	23 22 23 0200 Steam Piping, Pumps, Condensate Return, Simplex, 3/4 H.P. mtr, float switch, controls, 10 Gal. C.I. rcvr, 6-15	Ea.	6,550
4	23 21 20 70 0140 Hydronic HVAC Piping Specialties, Steam Trap, 2" pipe size, with thermic vent & check valve	Ea.	4,600
200	22 11 13 0620 Facility Water Distribution Piping, Pipe Steel, 2-1/2" diameter	L.F.	6,400
200	22 07 19 4304 Plumb. Piping Insulation: Pipe covering, Cellular glass, closed cell foam, all serv. jacket, sealant, 2-1/2" iron pi	L.F.	2,250
Totals			\$ 22,200
Design Fee			\$ 4,440
Contingency			\$ 4,440
General Conditions, Insurance, Taxes			\$ 2,220
Total Costs			\$ 33,300

### #2M-HS - High School: Remove Finned-Tube-Steam Radiators, Install New Ducted Air-Handler W/ Hydronic Heating Coil Suspended in Gym

Qty	Description	Unit	Total Incl. O&P
	<b>Demolition</b>		
1	Remove Existing Steam Heating Finned-Tube Convectors (2 @ 100 L.F. Ea.), Steam Piping and Traps	L.S.	1,100
	<b>New Construction</b>		
1	D3050 203 Packaged A/C, Hot Wtr. Heat. Const. Volume, 5 Ton	Ea.	10,050
10	23 37 15 2540 Louvers Electric or pneumatic operation	S.F.	650
2	23 37 15 2560 Motor, for electric or pneumatic	Ea.	1,120
350	22 11 13 0620 Facility Water Distribution Piping, Pipe Steel, 2-1/2" diameter	L.F.	11,200
350	22 07 19 4304 Plumb. Piping Insulation: Pipe covering, Cellular glass, closed cell foam, all serv. jacket, sealant, 2-1/2" iron pi	L.F.	3,938
Totals			\$ 28,058
Design Fee			\$ 5,612
Contingency			\$ 5,612
General Conditions, Insurance, Taxes			\$ 2,806
Total Costs			\$ 42,086

## Construction Costs: Recommendations

### #3M-HS - Convert Existing High School Heating System Fuel Source: #2 Diesel Fuel to LP Gas

Qty	Description	Unit	Total Incl. O&P
	<b>Exterior Site Work</b>		
360	G1030 805 1460 Trenching Common Earth, 12' deep, 1 C.Y. bucket	L.F.	9,900
90	32 12 13 0460 Asphalt Paving, 3" thick	S.Y.	1151.10
	<b>Underground Gas Piping (New Tank to Building)</b>		
120	33 5113 Natural-Gas Distribution: Piping, gas service and distribution, polyethylene, 3" diameter, SDR 11	L.F.	1266.00
	<b>Boiler Room</b>		
1	Boiler Bumer Conversion: Diesel to LP Gas	L.S.	8,500

Totals	\$	20,817
Design Fee	\$	3,123
Contingency	\$	4,163
General Conditions, Insurance, Taxes	\$	2,082
<b>Total Costs</b>	\$	<b>30,185</b>

### #4M-HS - Replace Existing High School Boiler System With Modern LP Gas Boiler System

Qty	Description	Unit	Total Incl. O&P
	<b>Exterior Site Work</b>		
360	G1030 805 1460 Trenching Common Earth, 12' deep, 1 C.Y. bucket	L.F.	9,900
90	32 12 13 0460 Asphalt Paving, 3" thick	S.Y.	1151.10
	<b>Underground Gas Piping (New Tank to Building)</b>		
120	33 5113 Natural-Gas Distribution: Piping, gas service and distribution, polyethylene, 3" diameter, SDR 11	L.F.	1266.00
	<b>Boiler Room</b>		
1	23 05 05 Selective HVAC Demolition: Boilers 4600 thru 7000 MBH	Ea.	7,200
180	02 82 13 Asbestos Abatement, 0310 Pipes to 12" diameter including minor repairs	L.F.	2,160
400	02 82 13 Asbestos Abatement, 0310 Pipes to 12" diameter including minor repairs	S.F.	4,800
180	02 82 13 Asbestos Abatement, 0310 Pipes to 12" diameter including minor repairs	L.F.	2,160
1	D3020 130 1080 Boiler, cast iron, hot water, gas (Hot water boiler installation less boiler)	Ea.	30,371.00
1	Lochinvar Sync 1.5M, Vendor Price Quote	Ea.	29,030.00
1	D3020 330 Circulating Pump Systems, End Suction, Pump, base mtd with motor, 4" size, 7-1/2 HP, to 350 GPM	Ea.	13,383.00
1	D3020 330 Auxiliary Heating Pump	Ea.	5,025.00
	<b>Distribution Equipment: Convert Steam to Hot Water</b>		
6	Furnish and Install new steam unit ventilator, standalone digital controls, wire new t-stat, surface conduit, re-use exist o&g nrl	Ea.	36,150.00
90	23 82 36 1266 Finned Tube Radiation, 2" steel tube, 4-1/4" steel fin	L.F.	7,470.00
24	23 09 23 3229 Direct-Digital Control System for HVAC: Water temp.	Ea.	15,000.00

Totals	\$	165,066
Design Fee	\$	24,760
Contingency	\$	33,013
General Conditions, Insurance, Taxes	\$	16,507
<b>Total Costs</b>	\$	<b>239,346</b>

### #5M-HS - Repair High School Shop Building Air-Handling Unit

Qty	Description	Unit	Total Incl. O&P
1	23 05 93 1100 Testing, Adjusting, and Balancing for HVAC, Heating and ventilating unit	Ea.	440.00
1	Misc belts, sheaves, bearings	Ea.	650.00

Totals	\$	1,090
Design Fee	\$	-
Contingency	\$	218
General Conditions, Insurance, Taxes	\$	109
<b>Total Costs</b>	\$	<b>1,417</b>

### #6M-HS - High School Building Automated Control System: Replace Pneumatic Controls w/ Modern Direct-Digital Controls

Qty	Description	Unit	Total Incl. O&P
	<b>Control Components/DDC Systems</b>		
26	23 09 23 3229 Direct-Digital Control System for HVAC: Water temp.	Ea.	16,250.00
18	23 09 23 0130 subctr's quote incl. material & labor, analog inputs, sensors (avg. 50' run in 1/2" EMT), space temperature	Ea.	9,360
4	23 09 23 0190 subctr's quote incl. material & labor, status (alarms), digital inputs (avg. 50' run in 1/2" EMT), space static pres	Ea.	3,340
1	23 09 23 2110 subctr's quote incl. material & labor, status (alarms), digital inputs (avg. 50' run in 1/2" EMT), freeze	Ea.	340
1	23 09 23 2120 subctr's quote incl. material & labor, status (alarms), digital inputs (avg. 50' run in 1/2" EMT), fire	Ea.	305
2	23 09 23 2210 status (alarms), digital output (avg. 50' run in 1/2" EMT), start/stop	Ea.	534
1	23 09 23 3100 subctr's quote incl. material & labor, controller MUX panel, 48 point, incl. function boards	Ea.	520
1	23 09 23 4100 front end costs, computer (PC)/software program	Ea.	5,100
800	23 09 23 4400 front end costs, communications trunk cable	L.F.	2,360
26	23 09 23 4500 front end costs, engineering labor, excl. drafting	Point	1,677
26	23 09 23 4600 front end costs, calibration labor	Point	1,677
26	23 09 23 4700 front end costs, startup, checkout labor	Point	2,548
1	23 09 23 8050 applications software, basic maintenance manager software, excl. database entry	Ea.	1,525
26	23 09 23 8140 applications software, optimum start/stop	Point	845
	<b>Misc</b>		
1	Test and Balance System	L.S.	9,500

Totals	\$	55,881
Design Fee	\$	8,382
Contingency	\$	11,176
General Conditions, Insurance, Taxes	\$	5,588
<b>Total Costs</b>	\$	<b>81,027</b>

## Construction Costs: Recommendations

### #1M-JH - Convert Existing Junior High Heating System Fuel Source: #2 Diesel Fuel to LP Gas

Qty	Description	Unit	Total Incl. O&P
<b>Exterior Site Work</b>			
360	G1030 805 1460 Trenching Common Earth, 12' deep, 1 C.Y. bucket	L.F.	9,900
90	32 12 13 0460 Asphalt Paving, 3" thick	S.Y.	1151.10
<b>Underground Gas Piping (New Tank to Building)</b>			
120	33 5113 Natural-Gas Distribution: Piping, gas service and distribution, polyethylene, 3" diameter, SDR 11	L.F.	1266.00
<b>Boiler Room</b>			
1	Boiler Burner Conversion: Diesel to LP Gas	L.S.	8,500

Totals	\$	20,817
Design Fee	\$	2,082
Contingency	\$	4,163
General Conditions, Insurance, Taxes	\$	2,082
<b>Total Costs</b>	<b>\$</b>	<b>29,144</b>

### #2M-JH - Replace Existing Junior High Boiler System With Modern LP Gas Boiler System

Qty	Description	Unit	Total Incl. O&P
<b>Exterior Site Work</b>			
360	G1030 805 1460 Trenching Common Earth, 12' deep, 1 C.Y. bucket	L.F.	9,900
90	32 12 13 0460 Asphalt Paving, 3" thick	S.Y.	1151.10
<b>Underground Gas Piping (New Tank to Building)</b>			
120	33 5113 Natural-Gas Distribution: Piping, gas service and distribution, polyethylene, 3" diameter, SDR 11	L.F.	1266.00
<b>Boiler Room</b>			
1	23 05 05 Selective HVAC Demolition: Boilers 4600 thru 7000 MBH	Ea.	7,200
1	D3020 130 1080 Boiler, cast iron, hot water, gas (Hot water boiler installation less boiler)	Ea.	30,371.00
2	Lochinvar Sync 1.5M, Vendor Price Quote	Ea.	58,060.00
1	D3020 330 Circulating Pump Systems, End Suction, Pump, base mtd with motor, 4" size, 7-1/2 HP, to 350 GPM	Ea.	13,383.00
1	D3020 330 Auxiliary Heating Pump	Ea.	5,025.00
<b>Distribution Equipment: Convert Steam to Hot Water</b>			
12	Furnish and install new steam unit ventilator, standalone digital controls, wire new t-stat, surface conduit, re-use exist oas gnl	Ea.	72,300.00
16	D3050 140 1020 Cabinet Unit Heaters, Hydronic, 60 MBH	Ea.	59,760.00
28	23 09 23 3229 Direct-Digital Control System for HVAC: Water temp.	Ea.	17,500.00

Totals	\$	275,916
Design Fee	\$	27,592
Contingency	\$	55,183
General Conditions, Insurance, Taxes	\$	27,592
<b>Total Costs</b>	<b>\$</b>	<b>386,283</b>

### #3M-JH - Junior High Building Automated Control System: Replace Pneumatic Controls w/ Modern Direct-Digital Controls

Qty	Description	Unit	Total Incl. O&P
<b>Control Components/DDC Systems</b>			
28	23 09 23 3229 Direct-Digital Control System for HVAC: Water temp.	Ea.	17,500.00
22	23 09 23 0130 subctr's quote incl. material & labor, analog inputs, sensors (avg. 50' run in 1/2" EMT), space temperature	Ea.	11,440
4	23 09 23 0190 subctr's quote incl. material & labor, status (alarms), digital inputs (avg. 50' run in 1/2" EMT), space static pres	Ea.	3,340
1	23 09 23 2110 subctr's quote incl. material & labor, status (alarms), digital inputs (avg. 50' run in 1/2" EMT), freeze	Ea.	340
1	23 09 23 2120 subctr's quote incl. material & labor, status (alarms), digital inputs (avg. 50' run in 1/2" EMT), fire	Ea.	305
2	23 09 23 2210 status (alarms), digital output (avg. 50' run in 1/2" EMT), start/stop	Ea.	534
1	23 09 23 3100 subctr's quote incl. material & labor, controller MUX panel, 48 point, incl. function boards	Ea.	520
1	23 09 23 4100 front end costs, computer (PC)/software program	Ea.	5,100
1,000	23 09 23 4400 front end costs, communications trunk cable	L.F.	2,950
28	23 09 23 4500 front end costs, engineering labor, excl. drafting	Point	1,806
28	23 09 23 4600 front end costs, calibration labor	Point	1,806
28	23 09 23 4700 front end costs, startup, checkout labor	Point	2,744
1	23 09 23 8050 applications software, basic maintenance manager software, excl. database entry	Ea.	1,525
28	23 09 23 8140 applications software, optimum start/stop	Point	910
<b>Misc</b>			
1	Test and Balance System	L.S.	10,200

Totals	\$	61,020
Design Fee	\$	9,153
Contingency	\$	12,204
General Conditions, Insurance, Taxes	\$	6,102
<b>Total Costs</b>	<b>\$</b>	<b>88,479</b>

### #4M-JH - Junior High Auditorium: Ventilation Air System

Qty	Description	Unit	Total Incl. O&P
1	D3050 203 Packaged A/C, Hot Wtr. Heat, Const. Volume, 5 Ton	Ea.	10,050
10	23 37 15 2540 Louvers Electric or pneumatic operation	S.F.	650
2	23 37 15 2560 Motor, for electric or pneumatic	Ea.	1,120
250	22 11 13 0620 Facility Water Distribution Piping, Pipe Steel, 2-1/2" diameter	L.F.	8,000
250	22 07 19 4304 Plumb. Piping Insulation: Pipe covering, Cellular glass, closed cell foam, all serv. jacket, sealant, 2-1/2" iron pi	L.F.	2,813

Totals	\$	22,633
Design Fee	\$	4,527
Contingency	\$	4,527
General Conditions, Insurance, Taxes	\$	2,263
<b>Total Costs</b>	<b>\$</b>	<b>33,949</b>

## Construction Costs: Recommendations

### #8M-JH - Replace 4 Existing Steam Heating Unit Ventilators w/ New Hot Water Ventilators

Qty	Description	Unit	Total Incl. O&P
4	Furnish and install new hot water unit ventilator, stand alone digital controls, wire new t-stat, surface conduit, re-use exist oas	Ea.	24,100
Totals			\$ 24,100
Design Fee			\$ 3,615
Contingency			\$ 2,410
General Conditions, Insurance, Taxes			\$ 2,410
Total Costs			\$ 32,535

### #1M-EL - Replace Steam Traps in Tunnels Below Classrooms

Qty	Description	Unit	Total Incl. O&P
3	23 21 20 70 0140 Hydronic HVAC Piping Specialties, Steam Trap, 2" pipe size, with thermic vent & check valve	Ea.	3,450
Totals			\$ 3,450
Design Fee			\$ -
Contingency			\$ 690
General Conditions, Insurance, Taxes			\$ 345
Total Costs			\$ 4,485

### #2M-EL - Elementary School Gymnasium Air-Handling Unit: Repair/Replace Steam Trap, Clean and Flush Heating Coil

Qty	Description	Unit	Total Incl. O&P
1	23 21 20 0210 Hydronic HVAC Piping Specialties, Steam Trap, 1-1/2" pipe size, with thermic vent & check valve	Ea.	710
1	Clean and flush heating coil	L.S.	850
Totals			\$ 1,560
Design Fee			\$ -
Contingency			\$ 312
General Conditions, Insurance, Taxes			\$ 156
Total Costs			\$ 2,028

### #3M-EL - Elementary School Automated Control System: Replace Pneumatic Controls w/ Modern Direct-Digital Controls

Qty	Description	Unit	Total Incl. O&P
<b>Control Components/DDC Systems</b>			
34	23 09 23 3229 Direct-Digital Control System for HVAC: Water temp.	Ea.	21,250.00
46	23 09 23 0130 subctr's quote incl. material & labor, analog inputs, sensors (avg. 50' run in 1/2" EMT), space temperature	Ea.	23,920
4	23 09 23 0190 subctr's quote incl. material & labor, status (alarms), digital inputs (avg. 50' run in 1/2" EMT), space static pres	Ea.	3,340
1	23 09 23 2110 subctr's quote incl. material & labor, status (alarms), digital inputs (avg. 50' run in 1/2" EMT), freeze	Ea.	340
1	23 09 23 2120 subctr's quote incl. material & labor, status (alarms), digital inputs (avg. 50' run in 1/2" EMT), fire	Ea.	305
2	23 09 23 2210 status (alarms), digital output (avg. 50' run in 1/2" EMT), start/stop	Ea.	534
1	23 09 23 3100 subctr's quote incl. material & labor, controller MUX panel, 48 point, incl. function boards	Ea.	520
1	23 09 23 4100 front end costs, computer (PC)/software program	Ea.	5,100
2,500	23 09 23 4400 front end costs, communications trunk cable	L.F.	7,375
46	23 09 23 4500 front end costs, engineering labor, excl. drafting	Point	2,967
46	23 09 23 4600 front end costs, calibration labor	Point	2,967
46	23 09 23 4700 front end costs, startup, checkout labor	Point	4,508
1	23 09 23 8050 applications software, basic maintenance manager software, excl. database entry	Ea.	1,525
46	23 09 23 8140 applications software, optimum start/stop	Point	1,495
<b>Misc</b>			
1	Test and Balance System	L.S.	9,500
Totals			\$ 85,646
Design Fee			\$ 12,847
Contingency			\$ 17,129
General Conditions, Insurance, Taxes			\$ 8,565
Total Costs			\$ 124,187

### #4M-EL - Elementary School: Install Insulation and Weather Jacket To Exposed Refrigerant Piping

Qty	Description	Unit	Total Incl. O&P
90	22 07 19 4301 Plumbing Piping Insulation, Cellular glass, closed cell foam, all service jacket, sealant, 1" iron pipe size	L.F.	851
Totals			\$ 851
Design Fee			\$ -
Contingency			\$ 170
General Conditions, Insurance, Taxes			\$ 85
Total Costs			\$ 1,106

## Construction Costs: Recommendations

### #1E-HS - High School Egress Lighting

Qty	Description	Unit	Total Incl. O&P
6	Exterior Wall Pack with emergency lighting	Ea.	2,700.00
7	Combination exit/emergency lighting units	Ea.	2,135.00
4	emergency lighting units	Ea.	988.00
200	3/4" C	L.F.	868.00
4	#12 CU wiring	C.L.F.	206.00
Totals			\$ 6,897
Design Fee			\$ 690
Contingency			\$ 1,379
General Conditions, Insurance, Taxes			\$ 690
Total Costs			\$ 9,656

### #2E-HS - Upgrade Lighting: High School Gymnasium

Qty	Description	Unit	Total Incl. O&P
	Gymnasium		
24	26 05 05 Selective Electrical Demolition; Lighting 400W metal halide	Ea.	1,812.00
24	26 51 13 Interior Lighting Fixtures, and Ballasts: High bay, 2'x4', six T5HO/54 watt	Ea.	10,560.00
Totals			\$ 12,372
Design Fee			\$ 1,237
Contingency			\$ 2,474
General Conditions, Insurance, Taxes			\$ 1,237
Total Costs			\$ 17,321

### #3E-HS - Exterior Receptacle

Qty	Description	Unit	Total Incl. O&P
1	New weatherproof cover	Ea.	20.00
Totals			\$ 20
Design Fee			\$ -
Contingency			\$ -
General Conditions, Insurance, Taxes			\$ -
Total Costs			\$ 20

### #4E-HS -High School Panel Replacement

Qty	Description	Unit	Total Incl. O&P
	Weight Room		
1	Demo Existing Panel	Ea.	355.00
1	New Panels with breakers	Ea.	2,650.00
1	Connect existing conductors to new breakers	LS	800.00
Totals			\$ 3,805
Design Fee			\$ 381
Contingency			\$ 761
General Conditions, Insurance, Taxes			\$ 381
Total Costs			\$ 5,327

### #5E-HS -High School Gymnasium Fire Alarm Notification Devices

Qty	Description	Unit	Total Incl. O&P
2	Horn/Strobe	Ea.	500.00
2	Strobe	Ea.	360.00
1	Conduit/Wire/Connections to existing system	LS	1,000.00
Totals			\$ 1,860
Design Fee			\$ 186
Contingency			\$ 372
General Conditions, Insurance, Taxes			\$ 186
Total Costs			\$ 2,604

### #6E-HS -High School Restroom Fire Alarm Notification Devices

Qty	Description	Unit	Total Incl. O&P
2	Strobe	Ea.	360.00
1	Conduit/Wire/Connections to existing system	LS	700.00
Totals			\$ 1,060
Design Fee			\$ 106
Contingency			\$ 212
General Conditions, Insurance, Taxes			\$ 106
Total Costs			\$ 1,484

### #7E-HS - Upgrade Lighting: High School Wood/Welding Shops

Qty	Description	Unit	Total Incl. O&P
30	Demolition 8' Industrial Luminaires	Ea.	945.00
24	Interior Lighting Fixtures, and Ballasts: High bay, 2'x4', four T5HO/54 watt	Ea.	8,160.00
1	Additional Conduit/Wire	LS	800.00
Totals			\$ 9,905
Design Fee			\$ 991
Contingency			\$ 1,981
General Conditions, Insurance, Taxes			\$ 991
Total Costs			\$ 13,867

## Construction Costs: Recommendations

### #8E-HS - High School Restroom Receptacle Replacement

Qty	Description	Unit	Total Incl. O&P
2	GFI receptacles	Ea.	140.00
Totals			\$ 140
Design Fee			\$ -
Contingency			\$ 28
General Conditions, Insurance, Taxes			\$ -
Total Costs			\$ 168

### #1E-JH - Junior High Exterior Egress Lighting

Qty	Description	Unit	Total Incl. O&P
6	Exterior Wall Pack with emergency lighting	Ea.	2,700.00
150	3/4" C	L.F.	651.00
3	#12 CU wiring	C.L.F.	154.50
Totals			\$ 3,506
Design Fee			\$ 351
Contingency			\$ 701
General Conditions, Insurance, Taxes			\$ 351
Total Costs			\$ 4,908

### #2E-JH - Junior High Cafeteria Receptacle

Qty	Description	Unit	Total Incl. O&P
1	Rewire Receptacle	LS	100.00
Totals			\$ 100
Design Fee			\$ -
Contingency			\$ 20
General Conditions, Insurance, Taxes			\$ -
Total Costs			\$ 120

### #3E-JH - Junior High Fire Alarm Notification Devices

Qty	Description	Unit	Total Incl. O&P
1	Horn/Strobe	Ea.	250.00
6	Strobe	Ea.	1,080.00
1	Conduit/Wire/Connections to existing system	LS	1,200.00
Totals			\$ 2,530
Design Fee			\$ 253
Contingency			\$ 506
General Conditions, Insurance, Taxes			\$ 253
Total Costs			\$ 3,542

### #4E-JH - Upgrade Lighting: High School Wood/Welding Shops

Qty	Description	Unit	Total Incl. O&P
3	Demolition 8' Industrial Luminaires	Ea.	94.50
5	Interior Lighting Fixtures, and Ballasts: 4' industrial two T5/28 watt	Ea.	800.00
1	Additional Conduit/Wire	LS	200.00
Totals			\$ 1,095
Design Fee			\$ 109
Contingency			\$ 219
General Conditions, Insurance, Taxes			\$ 109
Total Costs			\$ 1,532

### #5E-JH - Library Receptacles

Qty	Description	Unit	Total Incl. O&P
10	Receptacles (outlet, box, cover, conduit, wire)	Ea.	1,950.00
2	20A/1P Circuit Breakers	Ea.	121.00
1	Additional Labor to Accommodate existing construction	LS	3,000.00
Totals			\$ 5,071
Design Fee			\$ 507
Contingency			\$ 1,014
General Conditions, Insurance, Taxes			\$ 507
Total Costs			\$ 7,099

### #6E-JH - Junior High/High School Clock System

Qty	Description	Unit	Total Incl. O&P
1	Clock System (average 250-350) per classroom	LS	7,500-10,500
Totals			\$ 7,500-10,500
Design Fee			\$ 750-1,050
Contingency			\$ 1,500-2,100
General Conditions, Insurance, Taxes			\$ 750-1,050
Total Costs			\$ 10,500-14,700

## Construction Costs: Recommendations

### #7E-JH - Junior High/High school Fire Alarm System

Qty	Description	Unit	Total Incl. O&P
1	Complete new Fire Alarm System	LS	25,000-40,000
Totals			\$ 25,000-40,000
Design Fee			\$ 2,500-4,000
Contingency			\$ 5,000-8,000
General Conditions, Insurance, Taxes			\$ 2,500-4,000
Total Costs			\$ 35,000-56,000

### #1E-EL - Elementary School - Circuit Revision

Qty	Description	Unit	Total Incl. O&P
Separate circuits with multiple classrooms to provide dedicated circuit to each classroom			
10	20A/1P Circuit Breakers	Ea.	605.00
1	Rewiring Effort for 10 classroom circuits	LS	10,000.00
New receptacles on exterior walls			
24	Receptacles (outlet, box, cover, conduit, wire)	Ea.	4,680.00
Totals			\$ 15,285
Design Fee			\$ 1,529
Contingency			\$ 3,057
General Conditions, Insurance, Taxes			\$ 1,529
Total Costs			\$ 21,399

### #2E-EL - Upgrade Lighting: Elementary School

Qty	Description	Unit	Total Incl. O&P
Gymnasium			
25	Demolition: Linear Fluorescent High Bay 8'	Ea.	1,500.00
20	High bay, 2'x4', four T5HO/54 watt	Ea.	6,800.00
1	Additional Conduit/Wire to accommodate revised locations	LS	500.00
Classrooms			
25	Demolition: Linear Fluorescent 8'	Ea.	787.50
8	16' linear Pendant (3-T5 Cross Section)	Ea.	6,400.00
Basement			
8	Demolition: Linear Fluorescent 8'	Ea.	252.00
16	4' Industrial 28W T5	Ea.	2,560.00
Totals			\$ 18,800
Design Fee			\$ 1,880
Contingency			\$ 3,760
General Conditions, Insurance, Taxes			\$ 1,880
Total Costs			\$ 26,319

### #3E-EL - Elementary School Fire Doors

Qty	Description	Unit	Total Incl. O&P
Weight Room			
2	Door Holder	Ea.	700.00
1	Conduit/Wire/Connection/Testing	LS	1,300.00
Totals			\$ 2,000
Design Fee			\$ 200
Contingency			\$ 400
General Conditions, Insurance, Taxes			\$ 200
Total Costs			\$ 2,800

### #4E-EL - Elementary Exterior Egress Lighting

Qty	Description	Unit	Total Incl. O&P
8	Exterior Wall Pack with emergency lighting	Ea.	3,600.00
150	3/4" C	L.F.	651.00
3	#12 CU wiring	C.L.F.	154.50
Totals			\$ 4,406
Design Fee			\$ 441
Contingency			\$ 881
General Conditions, Insurance, Taxes			\$ 441
Total Costs			\$ 6,168

### #5E-EL - Elementary School - Panel Replacement

Qty	Description	Unit	Total Incl. O&P
5	Demo Existing Panel	Ea.	1,775.00
5	New Panels with breakers	Ea.	13,250.00
1	Demo Existing Main Distribution	Ea.	600.00
1	New Main Distribution Panel	Ea.	6,000.00
1	Connect existing conductors to new breakers	LS	8,000.00
Totals			\$ 29,625
Design Fee			\$ 2,963
Contingency			\$ 5,925
General Conditions, Insurance, Taxes			\$ 2,963
Total Costs			\$ 41,475

## Construction Costs: Recommendations

### #6E-EL -Elementary School - Feed Through Lug Panels

Qty	Description	Unit	Total Incl. O&P
2	Demo Existing Panel	Ea.	710.00
2	New Panels with breakers	Ea.	5,700.00
1	Connect existing conductors to new breakers	LS	2,000.00
Totals			\$ 8,410
Design Fee			\$ 841
Contingency			\$ 1,682
General Conditions, Insurance, Taxes			\$ 841
Total Costs			\$ 11,774

### #7E-EL -Elementary School - Splicing and Wiring

Qty	Description	Unit	Total Incl. O&P
1	Demo Existing Panel	CLF	180.00
2	Junction boxes	Ea.	400.00
1	Connections and Termination	LS	300.00
Totals			\$ 880
Design Fee			\$ 88
Contingency			\$ 176
General Conditions, Insurance, Taxes			\$ 88
Total Costs			\$ 1,232

### #8E-EL - Elementary school Fire Alarm System

Qty	Description	Unit	Total Incl. O&P
1	Complete new Fire Alarm System	LS	25,000-40,000
Totals			\$ 25,000-40,000
Design Fee			\$ 2,500-4,000
Contingency			\$ 5,000-8,000
General Conditions, Insurance, Taxes			\$ 2,500-4,000
Total Costs			\$ 35,000-56,000

### #9E-EL -Elementary School Clock System

Qty	Description	Unit	Total Incl. O&P
1	Clock System (average 250-350) per classroom	LS	6,000-8,400
Totals			\$ 6,000-8,400
Design Fee			\$ 600-840
Contingency			\$ 1,200-1,680
General Conditions, Insurance, Taxes			\$ 600-840
Total Costs			\$ 8,400-11,760